SIMPLE ADD-ON MAKES ANY AIRCRAFT EASIER TO FLY!

page 74

MODEL Airplane NEWS

BIG GUIDE TO SMALL PLANES

1/2A kits, engines, tips and more!

Secrets to a seamless finish for ABS plastic

REVIEWED

Fokker Dr.1—WW I ARF

Virus 400A—backyard fun

Somethin' Extra—sport flyer

Aresti—.40 aerobat

BUILD AND FLY AN RC BIRD

JUNE 2002

USA $4.99 CANADA $7.50

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MODEL Airplane NEWS
JUNE 2DD2 VOLUME 130, NUMBER 6

ON THE COVER: reviewed by David Johnson on page 48, the Arizona Model Aircrafters Fokker Dr.I is a 62-inch-span ARF model that's easy to assemble and looks great. Powered by an O.S. .52 4-stroke, the model has excellent flight characteristics (photo by Walter Sidas).

FEATURES

CONSTRUCTION

COLUMNS

FLIGHT TESTS

PHOTO BY RICH URAVITCH

DEPARTMENTS

Small planes, big fun

Global's Focke-Wulf Fw-190.

Who says bigger is better? Small, 1/2A-powered model planes are easier to transport, less expensive, less time-consuming to build and use fewer building materials than their larger brethren. Besides, as small-airplane aficionado Randy Randolph said to me once, "They're so darn cute, and you can have a lot more of 'em in your shop!" In this issue, we've compiled information on more than 70 1/2A kits and almost-ready-to-fly models, along with engine availability, prices and tips to keep your small model airborne. These planes and engines have been popular for decades, and now, even more designs are available to choose from. Turn to our "V2A to Z Guide" on page 28 to see why good things often come in small packages.

Lanier ½A Shrike.

FLYING BREAKTHROUGH

Another good, small thing we recently evaluated is the FMA Co-Pilot—an electronic, onboard unit that has something to offer pilots of all abilities. Using miniature, infrared sensors to distinguish between the cooler sky and warmer ground temperatures, the Co-Pilot automatically stabilizes any model in any flying attitude and wind condition. We tested it in a high-wing, electric trainer, a low-wing, glow-powered aerobat and a high-performance helicopter, and it passed with flying colors! To find out more about this amazing device, see our review on page 74.

Ever wonder how some modelers get such beautiful results when they join ABS plastic parts? This month, associate editor Rick Bell shares his expert techniques for achieving a seamless, one-piece look on a two-piece engine cowl and wheel pants. With Rick's step-by-step instructions, you'll have a great-looking model in less time—and with less effort—than you thought possible.

BIRD-LIKE FLIGHT

Contributor Bob Hoey has more than 11 years of experience designing bird-like RC models that have remarkable stability without a vertical fin or rudder; this month, he shares his design techniques and theory along with plans for his RC Turkey Vulture. Though the real bird (and Bob's model) may be lacking in beauty, they both have graceful soaring ability in abundance. Built using traditional balsa and plywood techniques, Bob's anatomically correct model is nearly impossible to tell from the real thing as it flies overhead.

Even a big old pelican can be modeled. Notice its graceful wingtip aileron feathers.

The first major event to kick off the annual flying season, the 2002 Florida Jets—as always—boasted a great turnout and featured the latest developments in model-jet technology. Two of the highlights of this fly-in—the new Eurofighter and F-100F Super Sabre kits—wowed the crowds; check out these models and more afterburner action on page 36. 4-

MODEL Airplane NEWS
FOUNDED 1929

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LOVE THAT LITHOPLATE

In his February 2001 "Scale Techniques" column, George Leu mentioned 0.005 lithoplate for detailing a Midwest Texan, and **this material** was also mentioned in a review of Balsa USA's Cub (April 2001 issue).

I gather that lithoplate is a thin, soft aluminum sheet, but what is it exactly, and where can I buy it in various thicknesses? I'd appreciate the info; I subscribe to the magazine and read every issue. Thanks, [email]

RAY SCHMIDT

Ray; lithoplate is a thin aluminum sheet material used by printing-press operators to print newspapers and other publications. After a run, the sheets of lithoplate are set aside, and when the bins are full, they are sent to be recycled. Each plate (sheet) is about 18x24 inches; you can buy used sheets for a song; I paid about 25 cents apiece! I bought a stack several years ago at a local print shop for 20 bucks and still have enough to last a lifetime! The ink on the plate must be cleaned off before you can use the material, but it is water-soluble so cleaning is very easy. Use a mixture of hot soapy water and a little rubbing alcohol. The aluminum is very thin (0.005 to 0.010 inch) and can easily be cut with a pair of scissors. The material has been hardened slightly by the printing process, but if you heat it quickly with a torch, you can anneal it to make it easier to bend and form. If you use it to make flat panels on your model, rubber cement or spray adhesive works well to hold it in place. Hope this helps. GY

BIG BIPLANES

In the April 2002 issue, I read with great interest your "Thinking Big" column on biplanes. I am currently building a 1/6-scale Boeing F4B-1, 1930s Navy biplane from an RCM plan. The upper wing has a 60-inch span and 10-inch chord. The bottom wing has a span of 48 inches with a *71/2*-inch chord. The stagger is positive, with the leading edge of the bottom wing set *55/8* inches aft of the leading edge of the upper wing. The decalage angle is designed to be slightly negative, with 2 degrees positive incidence on the bottom wing and 1 degree positive incidence on the upper wing. Since the upper wing is much larger in area, it will have much more lift than the lower wing. Both airfoils are essentially flat on the bottom.

Even though the wings differ in span and chord, shall I still calculate the mean aerodynamic chord (MAC) and balance point in the same way as shown in Figure 3 of that article, with the balance point 25

percent of MAC aft of the upper-wing leading edge? Thank you for your help. Great article!

BILL TRUEBLOOD
Edgewater, MD

Bill; thank you for your feedback. It is true that the bigger wing will generate a larger portion of the lift than the smaller wing, even with the slight difference in incidence. In practice, the model will behave normally. Use the horizontal distance from the top wing leading edge to the bottom wing trailing edge as the MAC line, then use the 25 percent point location for the balance point. This will be a safe place to start. Also, check where the plan designer indicated the CG. I always start there and adjust accordingly after I've test-flown the model. Depending on the model's behavior, you may still have to slightly adjust its balance point one way or the other. When you finish your model, send us a picture for "PilotProjects." GY

GYRO GYRATIONS

I just finished reading Rick Bell's article about gyros. It was very helpful, as I have always been curious about them and how they work. I hope you can answer a question. In the section, "Uses for gyros," it states that using a gyro on the elevator and the rudder can help a modeler learn to torque roll. If I want to connect a gyro to a particular axis for the rudder and another axis for the elevator, does that mean I need two gyros?

JEFF COOMBES,
Austin, TX

Jeff; I'm glad that you found the information in the gyro article useful. I had a lot of fun researching the article and learned a lot about gyros along the way. To answer your question: at the present time, gyros control only one axis at a time; so, yes, you'll need to use a separate gyro on each control surface (elevator and rudder). You can hook up both (with a Y-harness) to a single auxiliary channel, so you'll be able to timi them off when you're not using them. Otherwise, the gyros will be active all the time, and that will affect your control inputs. Be sure to thoroughly test the gyro inputs and the gain featiire before flying. RB

COOL IT!

A brief note to express my gratitude for the very informative article entitled "Cool It" that appeared in your April 2002 issue. Thanks to it, many of my longstanding questions about model engine fuels and engines were answered—a classic example of the instructive and understandable content you provide. Not all of us are engineers, but we are people who thoroughly enjoy model airplanes.

ED GILLANDERS
Poulsbo, WA

Thanks for your kind words regarding the engine-cooling article. It's always a pleasure to hear from readers who benefited from our efforts! DAVE GIERKE

AIR SCOOP

by the Model Airplane News *crew*

NEW PRODUCTS OR PEOPLE hit the model airplane market all the time, so here's the inside source for what's hot and where you can get it. Every issue, we sift through product announcements, show reports, rumors and prototypes to let you in on the best and the latest. Remember, you saw it here first!

WATTAGE

POWERFAN

WattAge makes a triumphant entrance into the ever-growing ducted-fan market with the introduction of its new 400/6 PowerFan, a lightweight, affordable unit capable of amazing thrust. The entire fan unit weighs only 1.27 ounces, and coupled with the Mabuchi 400-size motor, it's able to deliver 12.62 ounces of thrust at 24,500rpm. In addition, the fan blades are constructed of special material that ensures stiffness and an accurate mold. The complete unit sells for $35, but you can buy the fan alone (without the motor) for $26.

WattAge; distributed by Global Hobby Distributors, 18480 Bandilier Cir., Fountain Valley, CA 92708; (714) 964-0827; fax (714) 962-6452; www.globalhobby.com.

T-38 Talon

BOB FIORENZE

Jet enthusiasts everywhere are sure to take notice of this new T-38 Talon from Bob Fiorenze. You could power this 48-inch-wingspan model with a .91 engine, but for some true jet action, why not throw in a turbine? The kit features an epoxy-primed fiberglass fuselage, a large, premolded flanged hatch, molded-in panel lines, rivets and access panel details and precut foam flying surfaces. It also comes with fiberglass inlets and bifurcated exhaust duct, flying stab hardware, a clear canopy, a fiberglass canopy frame, 3-views, plans, former templates and a photo-illustrated instruction manual. The Talon is now available at a special introductory price of $795.

Bob Fiorenze, 401 Westchester Dr., Altamonte Springs, FL 32701; (407) 673-9080; www.rcaviation.com/fiorenze.

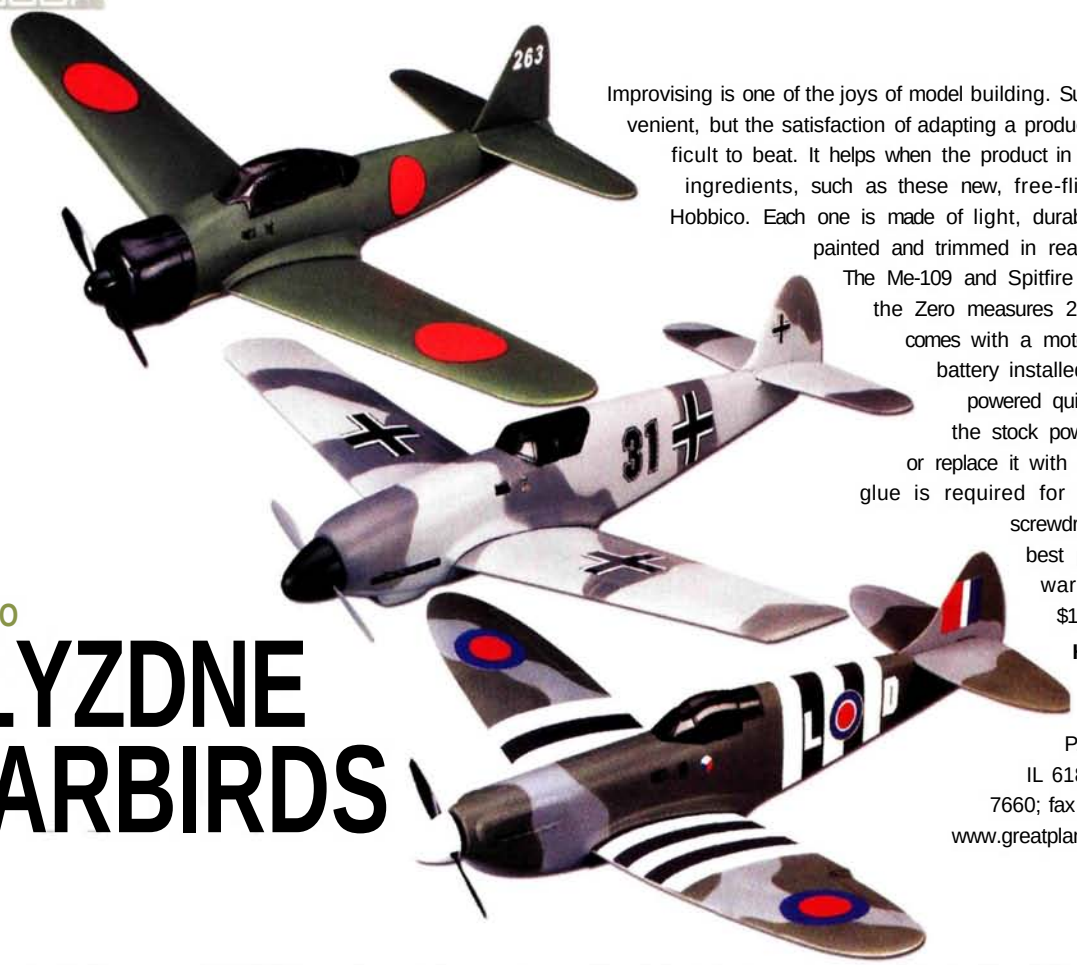
kabriolin and Aero 45

ESPRIT MODEL

Esprit Model's Line of fine-quality model products seems to be getting bigger and better by the day, and for that matter, so do its planes. Check out this 55-inch-wingspan Kabriolin. Designed specifically with aerobatics in mind, the Kabriolin features an extremely lightweight balsa and plywood construction that makes it an ideal 3D trainer. Use electric or glow power—it's your choice! All of the supplied mounting parts support both options. Should you choose glow, the Kabriolin can be powered by a .40 to .50 2-stroke or .45 to .72 4-stroke engine. It comes with a white, gelcoated epoxy cowl complete with molded-in air vents and an easily removable canopy for simple battery changes. The Kabriolin sells for $279.

And for you electrics enthusiasts out there, Esprit proudly introduces the new 64.5-inch-wingspan Aero 45. Powered by two Speed 480 motors, this semi-scale model of a 1940s-era Czechoslovakian courier plane features a classic balsa and ply construction with iron-on covering. The kit comes with all of the wood parts, plans, instructions, decals, necessary hardware and a stylish clear canopy, which really distinguishes this model. For extra performance, Esprit recommends that you install two Mega 22/10/6 brushless motors. The Aero 45 kit sells for $119.

Esprit Model, 657 Worcester St., #902, Southbridge, MA 01550; (508) 764-4990; fax (508) 764-4990; prop.rc@verizon.net; www. espritmodel.com.



HOBBICO

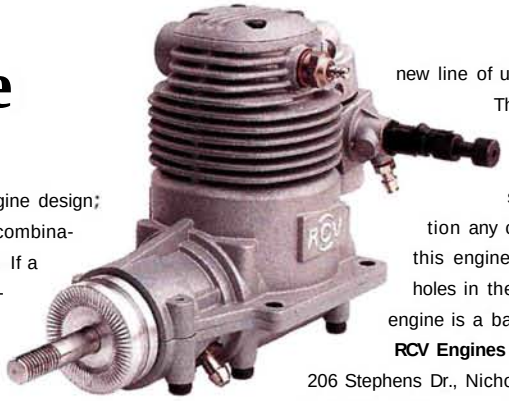
FLYZDNE WARBIRDS

Improvising is one of the joys of model building. Sure, ARFs are fun and convenient, but the satisfaction of adapting a product not meant for RC is difficult to beat. It helps when the product in question has aLl the right ingredients, such as these new, free-flight WW II fighters from Hobbico. Each one is made of light, durable foam and comes fully painted and trimmed in realistic colors and graphics. The Me-109 and Spitfire have 20-inch wingspans; the Zero measures 21.25 inches. Each plane comes with a motor, prop and rechargeable battery installed and includes a battery-powered quick charger. You can keep the stock power system for quick hops or replace it with your own micro gear. No glue is required for assembly; the included screwdriver is all you'll need. The best part is, these diminutive warbirds cost less than $16 each.

Hobbico; distributed by Great Planes Model Distributors Co., P.O. Box 9021, Champaign, IL 61826-9021; (800) 637-7660; fax (217) 398-0008; www.greatplanes.com.

RCV ENGINES LIMITED

Ultra-low-profile 4-stroke engine



There's just something about an unconventional engine design; being incurable gearheads, we're compelled by the combination of oddball mechanics and inspired engineering. If a quirky engine actually works well, it's darn near irresistible. Take the rotary valve 4-stroke engines from RCV Engines Ltd.; we reviewed the 120 in September 2001, and we loved its compact design and torquey performance. Now RCV has a new line of ultra-low-profile 4-strokes for other size applications. The first released is the .58ci RCV58-CD. Its rotary cylinder-valve technology allows an amazingly low engine height—just 66mm (2.6 inches)! That's considerably shorter than a .60-size 2-stroke, not to mention any comparable 4-stroke. Scale model builders take note; this engine will fit tight engine compartments without unsightly holes in the cowl. If it runs anything like its 120 big brother, this engine is a bargain at its expected price of $189.

RCV Engines Limited; distributed in the USA by Wildcat Fuels, Inc., 206 Stephens Dr., Nicholasville, KY 40356; (859) 885-5619; fax (859) 885-8549; www.wildcatfuel.com.

JK AEROTECH

P-47

JK Aerotech has answered the prayers of combat enthusiasts everywhere with the introduction of this 1/12-scale P-47 Thunderbolt. Constructed of extruded foam and corrugated plastic, the P-47 is covered entirely in packing tape for exceptional durability. This "three-in-one" kit can be built as a Razorback, a bubble-top, or a long-wing, high-altitude H version with a wingspan of from 42 to 47 inches. The kit features a canopy, spars, pushrods and control horns, plus a roll of colored tape for covering. It weighs 2.9 pounds and can be powered by a .25 to .46 engine. Best of all, the speed, agility and unlimited vertical performance of this P-47 can be yours for only $45.

JK Aerotech, 10800 SE Orient Dr., Boring, OR 97009; (800) 442-6755; www.jkaerotech.com.

JR

Voyager 50 CCPM 30 and Nem Heli Engine

Looking for big performance in a small package? Then JR's new Voyager 50 CCPM 3D Heli is just the ticket. The new Voyager is not much larger than most .30-size helis, so it's easy to transport and to store. The Voyager's design is based on the already popular Vigor series of helis and shares many of the same parts with the Ergo 30/46, so replacement parts are easy to get.

For quick assembly, the Voyager uses 120-degree CCPM and a belt-driven tail. This means a low parts count and easy setup for the demanding 3D pilot. With its small size and today's powerful .50-size engines, the Voyager has an outstanding power-to-weight ratio that gives the heli a performance level previously reserved for larger .60-size helicopters. The Voyager 50 costs $499.99.

For you power-hungry pilots, try the new IMZ RV50-S engine. Its performance features include a side-mounted slide valve carburetor with reed-valve induction. This smooth-running engine also includes a KSJ tuned muffler and sells for $479.99. If you're ready to try 3D helicopter flying, JR's Voyager 50 and IMZ RV50-S are a great way to get started.

JR; distributed by Horizon Hobby Inc., 4105 Fieldstone Rd., Champaign, IL 61822; (800) 338-4639; www.horizonhobby.com.

HANGAR 9

Pro-Lite Wheels

Why not enhance the appeal of your new scale plane with Hangar 9's new Pro-Lite Wheels. They not only contribute a great deal of scale realism, but they also save some weight. Each wheel features a skinned foam tire that looks like real rubber but weighs only a fraction of the real thing. The large hubs are also extremely lightweight and durable. The Pro-Lite Wheels range in size from l1/2 to 41/2 inches and in price from $4.99 to $24.99 each.

Hangar 9; distributed by Horizon Hobby Inc., 4105 Fieldstone Rd., Champaign, IL 61822; (217) 355-9511; www.horizonhobby.com.

FLAIR MODEL PRODUCTS

PT-17 Stearman

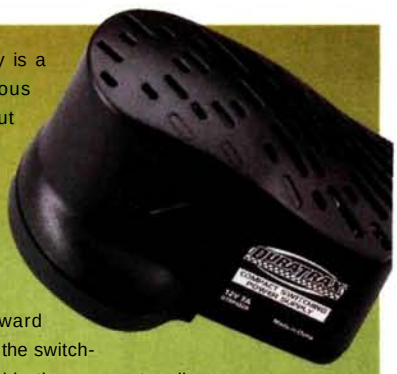
When it comes to scale models, it really doesn't get much better than the "Classic Scale" series from Flair Products, and this Boeing PT-17 Stearman is the newest addition to that high-quality line of kits. Powered by a 1.80 4-stroke engine, this l:4.3-scale model is capable of extremely scale performances. It will fly slow and steady, just like the real thing. The kit features CNC and die-cut parts, strip and sheet wood, a dummy engine, all of the necessary hardware, scale wheels (including a steerable tailwheel), full-size plan and instructions. It also comes with vacuum-formed moldings for the detail trim areas and fiberglass moldings for the forward fuselage and dummy crankcase. A fully sprung and damped undercarriage, various moldings for the windscreens and fairings and a complete closed-loop control system for the rudder and elevators round out this incredible package. It's even possible to customize your kit to represent a specific Stearman of your choosing. The price of this 89-inch-wingspan model was not available at press time, but it's expected to sell for between $400 and $450.

Flair Products Ltd.; distributed in the USA by Radical RC, 7046 Harshmanville Rd., Huber Heights, OH 45424; (937) 237-7889; fax (937) 237-1521; davthacker@aol.com; www. radicalrc.com.

DURATRAX

Compact Switching Power Supply

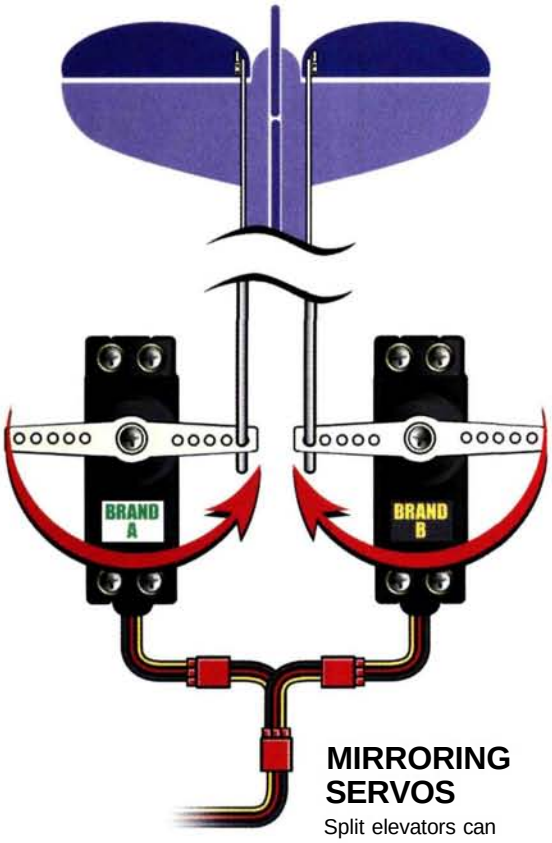
An AC-to-DC power supply is a must-have for any serious electrics enthusiast, but they are often too big and bulky to be conveniently transported. DuraTrax has solved that problem with its Compact Switching Power Supply. It is designed with an eye toward simplicity and convenience; the switching circuitry is housed inside the compact wall plug, along with a cooling fan. A removable 4-foot cord is connected to the terminal block adapter. The terminals are perfectly shaped to allow quick attachment of alligator clips of various sizes, and the mounting block ensures that they never accidentally touch and cause a short. Pads attached to the pc board on the bottom of the block enable you to solder wires directly to it. The unit's output is rated at 7 amps of 12V DC current—enough to handle most charging tasks; $62.99.



DuraTrax; distributed by Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826-9021; (800) 637-7660; fax (217) 398-0008; www.duratrax.com. *4-*

TIPS & TRICKS

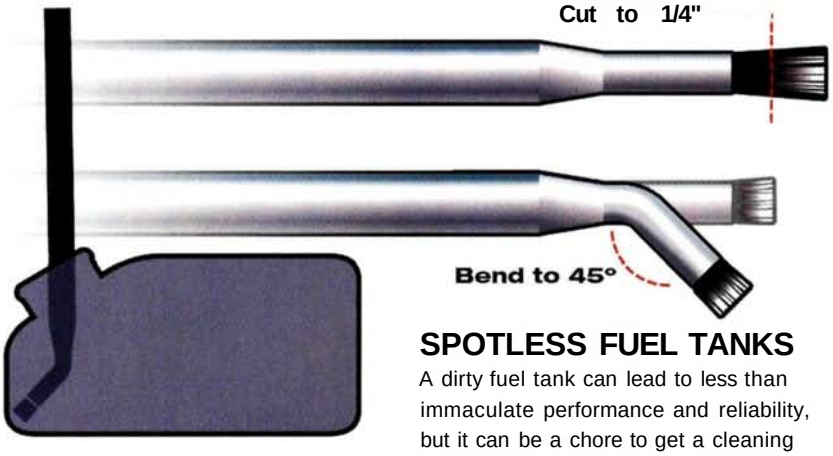
SEND IN YOUR IDEAS- (Mode/A/rp/arte News will give a free, one-year subscription (or one-year renewal, if you already subscribe) for each idea used in "Tips & Tricks." Send a rough sketch to *Model Airplane News,* 100 East Ridge, Ridgefield, CT 06877 4606 USA. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we can't acknowledge each one, nor can we return unused material.



MIRRORING SERVOS

Split elevators can cause problems if you connect two servos through a Y-harness. Servos of the same brand rotate in the same direction, and this can result in differing geometry between sides. This, in turn, produces unequal force and control-surface reaction. An easy way to avoid this is to use comparable servos from different brands that rotate in opposite directions. Of course, the servos should have roughly the same speed and torque characteristics, but most standard servos are enough alike to work.

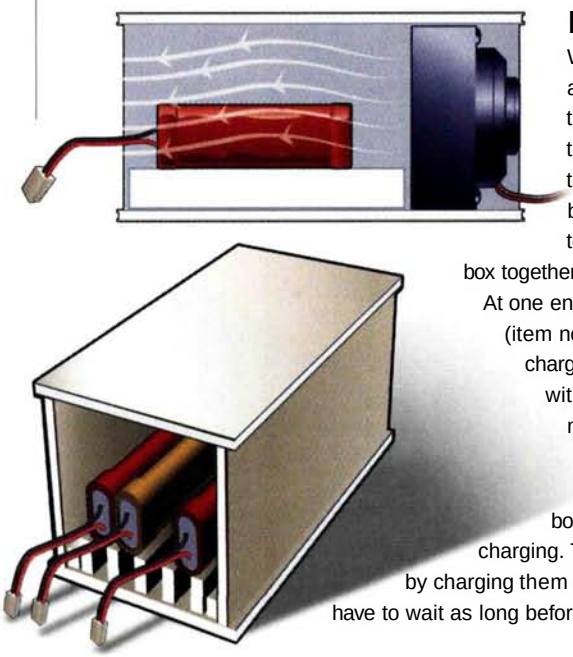
Thomas Smith, Aberdeen, MD



SPOTLESS FUEL TANKS

A dirty fuel tank can lead to less than immaculate performance and reliability, but it can be a chore to get a cleaning tool inside a tank. To make that easier, trim the bristles of a 6-inch acid brush to about 1/4 inch. Bend the brush tip to approximately 45 degrees to create your own tank scrubber. Pour an ounce or two of alcohol into the tank, swish it around, and let it sit for 15 minutes. Then, use your scrubber to clean the residue from inside the tank. If you need a sharper angle to reach a corner, bend the brush tip more. For really stubborn spots, cut the bristles slightly shorter to get more scrubbing action.

William Pote, Hobe Sound, FL



KEEP YOUR COOL

With electric power growing by leaps and bounds, here's a simple cooler box that you can build to get more flight time and take better care of your batteries. Cut a piece of 1/4-inch foamboard into two pairs of matching sides to make four sides of a box. Epoxy the box together, but leave two opposite ends open. At one end, insert a 12V fan from RadioShack (item no. RS 273 243B; $10). Place your charger on top of the cooler box (secure it with rubber bands, if desired) and connect the leads from the fan and the charger to a 12V source. Then, place your pack in the open end of the box to cool it down before and during charging. This way, you won't abuse your packs by charging them while they're still hot, and you won't have to wait as long before recharging.

Jack Hillyer, Seattle, WA

GRAB-MAGNET FOR SMALL PARTS

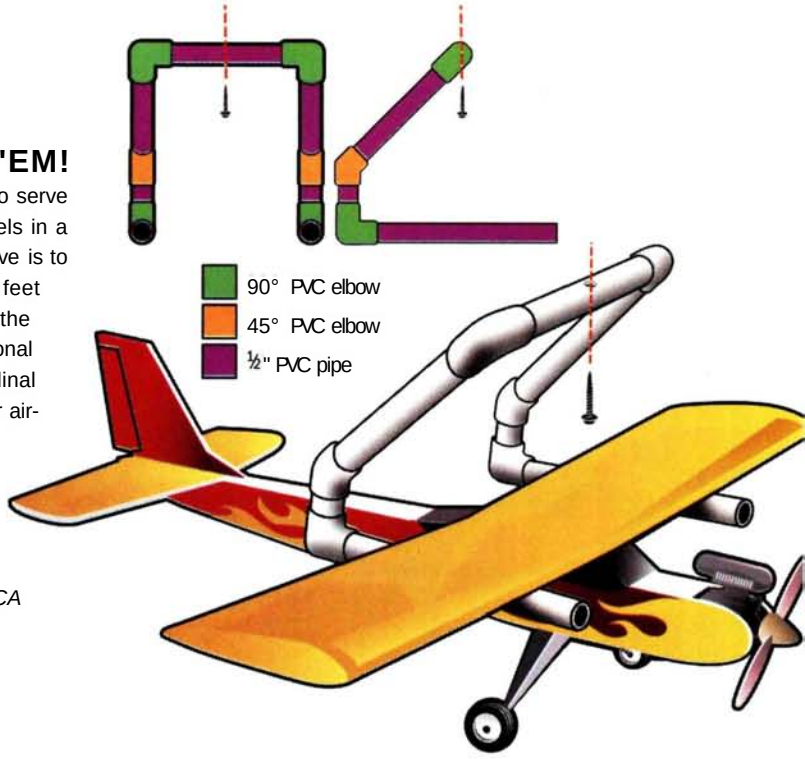
Little parts such as screws, pins, etc. can be difficult to retrieve one at a time from containers, and if you fish around with your fingers, you sometimes find the sharp end first—ouch! Next time, cut a strip from a flexible refrigerator magnet to fit into the container. The magnet will collect the parts from the bottom of the container, thereby making it easy for you to retrieve whichever part you need quickly and easily.

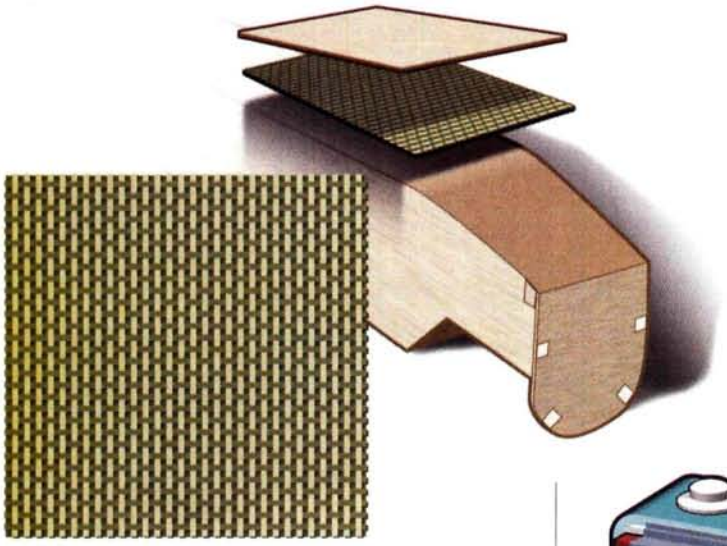
Kenneth Kent, Florence, OR

RACK 'EM!

Unless you're wealthy enough to add a new wing onto your house to serve as a 1/4-scale hangar, chances are that you have to store your models in a limited area. A great way to make the most of the space you have is to build a hanging rack out of 1/2-inch PVC pipe. You'll need about 4 feet of tube, four 90-degree elbows and two 45-degree elbows. Cut the tube into seven pieces: a top crosspiece, two medium-length diagonal extensions, two short vertical extensions and two long longitudinal extensions—exact lengths will vary, depending on the size of your airplane. At the midpoint of the crosspiece, drill a 3/16-inch hole to fit a 2-inch deck screw, from which you will hang the rack. When all the angles are squared, glue the pipe together, and just like that, you'll have a multipurpose plane rack for less than $2 in parts.

Jim Haslouer, Merced, CA

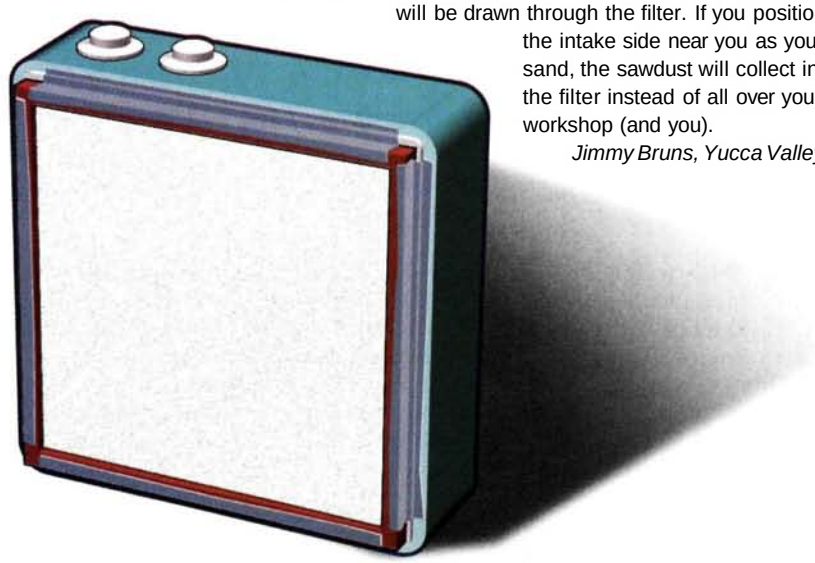




SAWDUST-FREE WORKSHOP

Here's a neat way to keep sawdust under control in your workshop. Take a standard box fan with a rectangular shroud and duct-tape a filter element from a forced-air heater/air conditioner onto the intake side of the fan. These filters are available in various sizes and can be found at hardware and home-improvement stores; they can be trimmed to fit, if necessary. Be sure to seal the edges well with the duct tape. When you turn on the fan, the intake air will be drawn through the filter. If you position the intake side near you as you sand, the sawdust will collect in the filter instead of all over your workshop (and you).

Jimmy Bruns, Yucca Valley, CA



BULLETPROOF YOUR PLANE

Kevlar weave is one of the strongest materials around; it's no coincidence that it is the prime ingredient in airbags and police body-armor. Ounce for ounce, it's much stronger than fiberglass, and as such, it's great for laminating into an airplane to reinforce high-stress areas such as firewalls, wing supports and landing-gear mounts. An inexpensive source for Kevlar is an auto junkyard; deflated airbags are easily found in late-model wrecks.

Donald Stach, Madeira Beach, FL

ALL-TEMPERATURE PUSHRODS

The plastic pushrods that are included in many kits can stretch or contract, depending on the temperature. This can throw off your trim settings and put extra stress on parts. A good way to avoid this problem is to run a length of wire through the center of the plastic-tubing pushrods. You can solder the clevises to the wire, which makes a stronger joint. More important, the wire will not be affected by temperature changes. The plastic pushrods now serve as support for the wires.

James McCoul, Sterling Heights, MI

UltraCote's back, am

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SEND IN YOUR SNAPSHOTS *Model Airplane News* is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable but please do not send digital printouts. We receive so many photographs that we are unable to return them. All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of the year. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in! Send those pictures to "Pilot Projects," *Model Airplane News,* 100 East Ridge, Ridgefield, CT 06877-4606 USA.

Harley Nelson,
Oregon, Wl
Z-137 AGRO TURBO

Our thanks to Harley for taking the time to send us photos of his homebuilt beauty. The design caught Harley's attention when it appeared in *Model Airplane News'* "Planes Worth Modeling" feature. Utilizing a bit of ingenuity, Harley used an overhead slide projector to enlarge the image from the magazine and take measurements. Knowing that he wanted his crop plane to hold 3 pounds of dust, he determined that his model would have to have a 100-inch wingspan and weigh 20 pounds—and it does! Harley's Z-137 is powered by a Moki 2.10 engine, which delivers 25 pounds of thrust turning a 20x10 prop. Harley expects the plane's performance to be good, and he intends to find out for sure as soon as summer arrives.

Todd Mazzei,
Calgary, Alberta, Canada
EXTRA 300L

Todd is pretty proud of his brother's plane—as well he should be. Thanks to Todd for sending in the photo, and kudos to his brother, Trent, on that incredible air-brushed paint job. This 37-percent-scale Aeroworks Extra 300L has a 116-inch wingspan and is equipped with a T.M.E smoke system. A model of this size requires a lot of power, and according to Todd, the 18hp 3W engine definitely does the trick. With more than 11 servos providing control, 3D maneuvers are certainly not a problem for this aerobat. Trent has flown his plane more than 75 times.

Byron Clark,
Sun City, AZ
FAIRCHILD PT-23

Byron's PT-23 may look familiar; it started out as a Dynaflite PT-19 kit. With a little bit of creativity and a lot of work, Byron transformed the kit by shortening the front end and adding a fiberglass ring cowl. He powers his PT-23 with a Saito R 1.70 and controls it with a Futaba T8UAF radio. It features a JHM Engineering onboard ignition system and is finished in a yellow, blue and striped rudder color scheme—the same as only one production run of the full-size aircraft was painted.

Jim Famed, Biloxi, MS
SOPWITH TRIPLANE

Our thanks to Jim for sending us this photo of his standoff scale WW I Sopwith Triplane, which he designed and built himself. Powered by an O.S. .25FP engine, Jim's fighter has a 39 3/4-inch wingspan and weighs 3 1/2 pounds. The model has a profile fuselage, but Jim widened the nose to accommodate the battery and receiver. Jim designed the plane for RC combat; it's the third in a series of 1/8 -scale WW I combat planes he's building. Jim says his model possesses all of the flight characteristics of the full-size plane; it isn't particularly fast, but it's extremely maneuverable and has a high rate of climb.

Mike Bridges, Hunt, TX
SCRATCH-BUILT CROP DUSTER

Crop dusters are gaining popularity as RC models, and when you see a plane like Mike's, you understand why. Who wouldn't want one of these? Mike scratch-built this plane with the help of his friend, David West; both are members of the Kerrville R.C. Flyers in Kerrville, TX. Powered by a U.S. 41cc engine and controlled by a JR radio, this 86-inch-wingspan model weighs 141/2 pounds and is covered with Stits Lite and MonoKote.

Jerome Wroblewski, Des Plaines, IL
SKYMASTER

Last summer, Jerome decided he needed a building project; the result is this beautiful scratch-built Skymaster. Jerome powers his model with an O.S. .65 2-stroke engine turning a 12x6 pusher prop. The 68-inch-wingspan model is constructed of lite-ply and balsa with a balsa-sheeted foam wing, and it's covered entirely in UltraCote. Jerome says his 91/2-pound model requires a long runway to gain speed before liftoff, but once airborne, it flies great and has very sensitive elevator input.

Col. Austin Ayotte, Austin, TX
EXTRA 300XS

As a retired Air Force, commercial airline and corporate pilot, Col. Ayotte certainly knows his way around a plane. Check out his Midwest Products Extra 300XS! It's powered by an O.S. BGX engine and controlled by an Airtronics Vision radio. The decals were courtesy of Die-hard Graphics. According to Col. Ayotte, this Extra is a great flyer, even though he admits to finding full-size airplanes much easier to fly than RC models.

John Giles,
Oklahoma City, OK
MONOCOUPE

This 72-inch scratch-built Monocoupe represents John's fourth attempt at modeling the aircraft, and according to him, it is by far the best performer yet. Powered by a Saito 1.00 engine spinning an APC 15x6 prop, John's Monocoupe weighs 9 pounds and features functional flaps and a Futaba radio system. John believes that working on this plane was a great way to spend his winter, and we have to agree.

David Hobbs,
Shawnee, KS
SCRATCH-BUILT PROFILE
David designed and built this profile fun fly—a truly unique model in that all of its control surfaces are of the pull/pull variety, including the ailerons. Powered by an O.S. .46 FX engine and controlled by a Hitec radio, David's profile plane has a 42-inch wingspan and weighs about 5 pounds. Four hatches on the top of the wing provide access to the aileron servo and radio equipment, and David built tunnels into the fuselage from the servos to the radio compartment to accommodate the servo electrical leads. The plane is covered in maroon and white MonoKote, and according to David, it flies very well with good characteristics at both low and high speeds.

Antonio Carlos Pimentel,
São Paulo, Brazil
BEECHCRAFT BONANZA
Hard to believe, but according to Antonio, this 1/5-scale Bonanza from Top Flite represents his first attempt at building a kit. One would certainly be hard pressed to distinguish his work from that of an experienced kit modeler. Antonio's Bonanza is constructed of balsa and plywood and covered with Oracover. Powered by a Magnum XL .912-stroke engine, the model features ABS plastic on the cowl, cabin and interior and is equipped with flaps and Robart pneumatic retracts. It's controlled by a Futaba 8-channel radio with 9 servos. 4

1/2A to Z

your guide to small glow models and engines

by the staff of Model Airplane News

No other type of RC airplane is more closely linked to the origins of the hobby than V2A models. These planes grew directly out of free-flight and control-line models, and they were among the first to exploit remote control. For many modelers, V2A was their first exposure to the hobby, and it remains among the most popular model sizes even today.

Why has V2A endured so successfully? To begin with, these planes are among the simplest, most enjoyable sport models to build. They are small and light, so they go together easily and fly beautifully. The advent of CAD plans and laser-cut parts has only improved those characteristics; now, 1/2 A kits are easier than ever to build. Because these kits are small and are constructed using conventional materials, they are also extremely affordable. That makes them ideal for less-experienced builders—especially those who may have cut their teeth on electric backyard flyers and would like to try glow power. And because of their compact design and light weight, they can fly in smaller spaces than standard-size glow-powered models. To top it off, there are more 1/2 A kits (not to mention several ARFs) available than ever before, and their quality is first rate.

Global's Focke-Wulf Fw-190 comes almost ready to fly (ARF; $99.99) or almost ready to cover (ARC; $84.99).

We've assembled a list of more than 70 kits and ARFs that were designed for V2A engines with displacements of. 10ci or less. There's a wide variety to choose from, from profile-fuselage sport models and trainers to scale warbirds and gliders. Once you spot a kit you like, check out our engine chart to find just the right powerplant for it. And don't miss the helpful tips on nitro content and 1/2 A support equipment from our noted experts, Dave Gierke and Randy Randolph. When you consider the style, nostalgia, convenience and selection that 1/2 A has to offer, we're sure you're going to want to give it a try!

S

Model like this Sig Mfg. R/C Rascal ($79.95; combine the size and style of classic free-flight models with modern RC control for a very reasonable price.*

1/2A ENGINES

MANUFACTURER	NAME	WEIGHT (OZ.)	DISPLACEMENT	THROTTLE	PRICE
AP Engines	Wasp	1.9 †	0.061	Y	$39.95
AP Engines	Hornet	5.5 †	0.09	Y	$49.95
Cox	Babe Bee	2.10	0.05	N	$47.29
Cox	Black Widow	2.10	0.05	N	$55.49
Cox	Texaco	2.30	0.05	N	$51.79
Cox	Killer Bee	2.00	0.05	N	$57.79
Cox	Pee Wee	0.75	0.02	N	$73.29
Cox	Tee Dee .010	0.50	0.01	N	$95.49
Cox	Tee Dee .049	1.90	0.05	N	$99.99
Fuji	.099 RC aircraft engine	4.32	0.10	Y	$149.99
Norvel	BigMiG Start'Up .049	2.39 t	0.05	N	$49.99
Norvel	BigMiG Start'Up .061	2.39 t	0.06	N	$45.99
Norvel	AME.Q49(CL/RC)	1.69/1.831	0.05	*	$55.99/$75.99
Norvel	AME .061 (CL/RC)	1.69/1.83 t	0.06	*	$55.99/$75.99
Norvel	BigMiG Sport .049 (CL/RC)	1.69/1.83?	0.05	*	$45.99/$59.99
Norvel	BigMiG Sport .061 (CL/RC)	1.69/1.83 t	0.06	*	$34.99/$59.99
Norvel	BigMiG Sport .074	2.65 t	0.07	Y	$75.99
Thunder Tiger	GP-07	3.33	0.07	Y	$49.99

t Weight includes muffler * Available in both control-line and RC versions

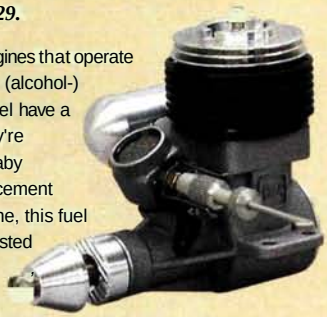
***House of Balsa Is known for Its high-quality, fine-scale V2A kits such as this 36-inch Beechcraft Bonanza;* $59.95.**

***House of Balsa Super Decathlon:* $59.95.**

***House of Balsa* P-51 *Mustang;* $59.95.**

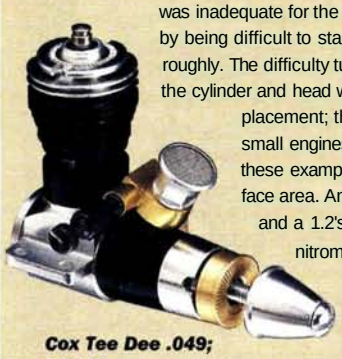
1/2A ENGINES & NITRO CONTENT *by Dave Gierke*

This Cox Babe Bee Is typical of the classic 1/2A and free-flight engines. It has no throttle and does not require a dedicated RC channel. The engine mount also serves as the fuel tank and the carb; after the needle Is tuned for the desired rpm, the engine will operate at a constant speed. Price: $47.29.



1/2A glow engines that operate on methanol- (alcohol-) dominated fuel have a problem-they're tremendously over-cooled! In the late 1940s, the newly developed "baby engines" barely ran on glow fuel that was formulated for larger displacement engines. Containing mostly alcohol, castor oil and a bit of nitromethane, this fuel was inadequate for the new breed of tiny engines. They protested by being difficult to start and touchy to adjust, and they ran roughly. The difficulty turned out to be the surface area of the cylinder and head when compared with the cylinder displacement; this important ratio is much larger for small engines than it is for large engines. Look at these examples of displacement versus cylinder surface area. An .049 has a ratio of 13:1, a .40's is 6:1, and a 1.2's is just 4:1. The solution? Add nitromethane to the fuel; between 25 and 35 percent works well.

The Norvel Big* WIG *Sport .074 ($75.99) is one of the newer generation of throttleable 1/2A engines. It operates much like any larger RC glow engine; a channel is assigned to control a servo that moves the throttle position on the carb.



Cox Tee Dee .049; $99.99.

Thunder Tiger GP-07; $49.99.

As we know, nitro adds power and heat to the operating cycle of any engine. Additional nitro allows the temperature of the crankcase to increase and provides needed thermal energy to vaporize liquid fuel components before transferring them to the cylinder for combustion. Vaporized fuel does a better job of mixing with air and burning than do liquid droplets in an over-cooled engine.

Cox sells this Engine Starting Kit for its 1/2 A engines. It includes a half-pint bottle of fuel, a battery box, a starting wand, fuel tubing, a glow-plug clip and an all-purpose wrench. Price: $11.99.

Here is a selection of 1/2 A props. Clockwise from top left: Girsh Tornado 6x5; *Cox 3-blade* 6x3; Cox Grey 5x3; Cox 5x3; *Cox 6x3.*

Ace Simple Ultimate Bipe; $44.99.

Ace Grasshopper; $34.99.

Here, my Cox Kilter Bee *.047 la mounted on a JK Aerotech Kwlk Mount I first primed the engine through the exhaust port.*

The next step Is to connect the glow plug and engage the spring starter.

Last, adjust the needle valve for smooth operation.

Engine startup

by Randy Randolph

All small engines like high-nitro (at least 15-percent) fuel. The starting procedure for engines such as the Cox Tee Dee series, Norvel and Thunder Tiger is much like that of any other engine with a front-intake carburetor: fuel, choke and flip; but with some V2A engines, a few steps make the initial startup unique.

The Cox reed valve engines such as the Pee Wee .020, the Black Widow .049, the Babe Bee .049 and the Killer Bee .049 are a little different! For these engines, you must install a 6x3 prop, close the needle valve, open it three turns, prime it with a drop or two of fuel through the exhaust ports, connect the glow plug and use the spring starter in the front of the engine to flip the prop. By design, reed-valve engines can run in either direction with ease, and the spring makes it easy for them to start in the right direction. These engines start almost automatically; once they have started, you simply adjust the needle as with any glow engine.

1/2A MODELS

MODEL	NO. OF CHANNELS	WIN (IN.)
*** ACE**		
Alpha	2 or 3	40
Grasshopper	2 or 3	43.5
Scooter ARF	3	57
Simple 400	2 to 4	34
Simple AT-6	2 to 4	35
Simple Extra	2 to 4	35
Simple F-4U	2 to 4	36
Simple Me-109	2 to 4	35
Simple P-51	2 to 4	35
Simple Piper J-3	2 to 4	35
Simple Ultimate	4	34
Whizard	2 or 3	40.7
*** CLANCY AVIATION**		
Lazy Bee	3	40
Lazy Bee Extended Wing	3	48
Lazy Bee Special	4	40
Lazy Bee Special Extended Wing	4	48
Speedy Bee	4	40
Stagger Bee	3	29.
Turbo Bee	3	40.2
yard Bee	3	29
DYNAFLITE		
Piece O' Cake		72
FUNAERO RC		
BooKaty	2 or 3	45
Flakey Jake	2 or 3	40
Super Jake	4	40
Tommy Boy	4	34
*** GLOBAL**		
Focke-WulfFw-190ARC	3	35
Focke-Wulf Fw-190 ARF	3	35
School Boy ARF	3	50
Super Sports Trainer ARF (SST-09)	3	35
HACKER		
Funny ARF	2 or 3	23.6
Mantis ARF	3	41
OspreyX-28GARF	4	43.2
TL-96 ARF	2 or 3	43.1
*** HERR ENGINEERING**		
Aqua Star	2 or 3	40.E
AT-6 Texan	2 to 4	36
Cloud Ranger	3	42
Cloud Ranger	4	42
P-51 Mustang	4	42
Piper Cherokee	2 or 3	42
Piper J-3 Cub	2 or 3	48
Pitts Special	4	30
Star-Cruiser	2 or 3	42

WING AREA (SQ. IN.)	MIN. WEIGHT (OZ.)	WING LOADING (OZ./SQ. FT.)	ENGINE RANGE (2-STROKE)	PRICE	NOTES
250	28	16.1	.049 to .09	$34.99	High-wing trainer; box fuselage with foam wing
214	20	13.5	.049 to .074	$34.99	High wing with stick tail boom; box fuselage with foam wing
400	23	8.3	GP.07	$199.99	High wing; built-up balsa structure; covering included; available combo with Thunder Tiger GP-07
180	16	12.8	.049 to .074	$24.99	Slab side, foam wing, sheet balsa tail
188	20	15.3	.049 to .074	$34.99	Semi-scale; foam wing, sheet balsa fuselage and tail
188	20	15.3	.049 to .074	$34.99	Semi-scale; foam wing, sheet balsa fuselage and tail
190	20	15.2	.049 to .074	$34.99	Semi-scale; foam wing, sheet balsa fuselage and tail
182	16	12.7	.049 to .074	$34.99	Semi-scale; foam wing, sheet balsa fuselage and tail
182	16	12.7	.049 to .074	$34.99	Semi-scale; foam wing, sheet balsa fuselage and tail
182	16	12.7	.049 to .074	$34.99	Semi-scale; foam wing, sheet balsa fuselage and tail
396	28	10.2	.10 to .20	$44.99	Semi-scale biplane; foam wings, sheet balsa fuselage and tail
204	24	16.9	.049 to .07	$34.99	High-wing trainer; box fuselage with foam wing
526	15	4.1	.049 to. 15	$59.99	High-wing; built up from pre-cut balsa and ply; shock-absorbing gear
638	16	3.6	.049 to .15	$64.99	Same as Lazy Bee, with 8-inch center wing section extension
526	15	4.1	.049 to. 15	$69.99	High wing; built up from pre-cut balsa and ply; ailerons; shock-absorbing gear
638	16	3.6	.049 to .15	$79.99	Same as Lazy Bee Special, with 8-inch center wing section extension
526	28	7.7	.09 to .25	$79.99	Mid-wing; built up from pre-cut balsa and ply; shock-absorbing gear
470	18	5.5	.061 to .20	$84.99	Biplane; built up from pre-cut balsa and ply; shock-absorbing gear
440	10.4	3.4	.061 to .074	$74.99	Internal ducted propeller-no fan unit required; built-up balsa and ply; drop-off gear
270	9	4.8	.010 to .10	$49.99	High-wing; built up from pre-cut balsa and ply; clear Mylar covering and wheels included
573	24	6.0	.049	$39.99	Powered glider trainer; all balsa construction
335	18	7.7	.049 to .061	$34.95	Powered glider; built up from laser-cut balsa and ply; combos with Norvel engines available
295	24	11.7	.049 to .061	$67.95	High-wing aerobat; built up from laser-cut balsa and ply; combos with Noivel engines available
295	25	12.2	.061 to .074	$48.95	High-wing aileron trainer; built up from laser-cut balsa and ply
272	22	11.6	.061	$39.95	Low-wing intermediate; built up laser-cut balsa and ply; combo with Norvel .061 engine available
220	22	14.4	.09 to .15	$84.99	Semi-scale; prebuilt wood structure; painted fiberglass cowl and canopy included
220	22	14.4	.09 to .15	$99.99	Semi-scale; prebuilt wood structure; camo covering, painted fiberglass cowl and canopy included
325	30	13.3	.09 to .15	$84.99	High-wing trainer; box fuselage; all-balsa structure; pre-covered; combos with AP Hornet engines availabl
270	25.6	13.7	.074 to. 15	$89.99	High-wing trainer; all-balsa construction; factory-applied covering; combo with AP Hornet .09 engine available
194	17.6	13.1	.049 to .061	$79.99	High-performance biplane; factory-applied covering
TK	22	TK	.049 to .09	$149.99	Low-wing aerobat; fully assembled balsa and ply structure covered in Easycoat film
318	23	10.4	.061 to .09	$244.99	Aerobatic seaplane with ailerons; one-piece fiberglass fuselage; balsa wing and tail covered in Easycoat film
279.5	14.1	7.3	.061 to .10	$109.99	Semi-scale low-wing; one-piece fiberglass fuselage; balsa wing and tail covered in Easycoat film
245	19	11.2	.049 to .061	$68.95	Seaplane; laser-cut wood parts; tab and notch construction
190	19	14.4	.049 to .061	$63.95	Sport scale; laser-cut wood parts; tab and notch construction; removable landing gear
296	16.5	8.0	.049 to .061	$76.95	High-wing sport model; laser-cut wood parts; tab and notch construction; less than 1 hour construction time
324	16.5	7.3	.049 to .061	$76.95	Same as above, with ailerons
303	22	10.5	.049 to .074	$99.95	Sport scalfi; laser-cut wood parts; tan and nntr.h construction; accessories included
293.2	19	9.3	.049 to .061	$84.95	Sport scale; laser-cut wood parts; tab and notch construction; accessories included
328	20	8.8	.049 to .061	$85.95	Sport scale; laser-cut wood parts; tab and notch construction; accessories included
301	26	12.4	.074 to .15	$99.95	Sport scale biplane; laser-cut wood parts; tab and notch construction; accessories included
267	17	9.2	.049 to .061	$88.95	High-wing trainer; laser-cut wood parts; tab and notch construction; steerable nose gear

Norvel UCAN-2 ARF; $79.99.

Lanier Stinger 10; $34.99.

Hen Engineering AT-6 Texan; $63.95.

JK Aerotech T-52 Trainer ARF; $116.90, including Norvel engine.

Ace Simple F-4U; $34.99.

The Global School Boy ARF ($84.99) is typical of V2A, almost-ready-to-fly models. It is fully covered, and most of the major assembly is complete, right out of the box.

SPECIFICAT 1a N

MODEL	NO. OF CHANNELS	WING (IN.)
*** HOBBY HANGAR**		
Mini Edge 540	2 to 4	32
Mini Sukhoi	2 to 4	34
*** HOUSE OF BALSA**		
1/2 A Stealth Sport	2	32
Bonanza	2 to 4	36
Chipmunk	2 to 4	36
Extra 300L Profile	2 to 4	36
Floatplane .10	4	45.5
FW190A	2 to 4	36
J-3 Cub	2or3	52.5
Laser Stick .10	2 to 4	45.5
Me-109E	2to4	36
P47 Thunderbolt	2 to 4	36
P-51 D Mustang	2 to 4	36
P-51 D Mustang Profile	2 to 4	36
Spacewalker.10	2 to 4	47
Sukhoi SU-31	2 to 4	36
Super Decathlon .10	2 to 4	47
*** JK AEROTECH**		
Pocket Planes P51 Mustang	2 or 3	26
T-52 Trainer	2 to 4	52
*** LANIER RC**		
kA Shrike	2or3	24.5
Dominator200	4	24.75
Indicator	2	28
Stinger 10	4	36
***NORVEL**		
GlassAir 400	2or3	72.8
GlassAir SeaEasy ARF	4	43.3
Neofun Classic ARF	2 or 3	41
Neofun UCAN-2 ARF ;	3or4	41
Neofun Vision ARF	2or3	41
• PECK-POLYMERS		
Prairie Bird	2or3	49
• SIG MFG.		
Hummer	2	34
R/C Rascal	3	49
Wonder	2or3	37.5

'ING AREA >Q. IN.)	MIN. WEIGHT (OZ.)	WING LOADING (OZ./SQ. FT.)	ENGINE RANGE (2-STROKE)	PRICE	NOTES
05	19	13.3	.061 to. 10	$44.99	Semi-scale aerobat; built-up wood construction
45	20	11.8	.061 to .10	$41.99	
52	18	10.3	.049	$34.95	Twin tail boom sport model; balsa and ply construction
16	22	14.7	.051 to .10	$59.95	Standoff scale; balsa and ply construction; formed plastic fuselage top and cowl
16	22	14.7	.051 to .10	$59.95	Standoff scale; balsa and ply construction; formed plastic fuselage top and cowl
79	22	11.4	.061 to. 12	$54.95	Profile fuselage aerobat; laser-cut balsa and ply, Du-Bro hardware included
18	32	14.5	.09 to. 12	$59.95	Sport floatplane; laser-cut balsa and ply construction
16	22	14.7	.051 to .10	$59.95	Standoff scale; balsa and ply construction; formed plastic fuselage top and cowl
50	24	9.9	.049 to .074	$49.95	Semi-scale trainer; balsa and ply construction; pre-formed aluminum gear; sheeted fuselage and tail
18	30	13.6	.047 to. 12	$44.95	High-wing trainer; balsa and ply construction; pre-formed aluminum gear
16	22	14.7	.051 to .10	$59.95	Standoff scale; balsa and ply construction; formed plastic fuselage top and cowl
16	22	14.7	.051 to .10	$59.95	Standoff scale; balsa and ply construction; formed plastic fuselage top and cowl
16	22	14.7	.051 to. 10	$59.95	Standoff scale; balsa and ply construction; formed plastic fuselage top and cowl
79	22	11.4	.061 to .12	$54.95	Profile fuselage warbird; laser-cut balsa and ply, Du-Bro hardware included
29	28	12.3	.074 to .12	$59.95	Semi-scale aerobat; balsa and ply construction; pre-formed aluminum gear
79	22	11.4	.061 to .12	$59.95	Profile fuselage aerobat; laser-cut balsa and ply, Du-Bro hardware included
29	24	10.5	.061 to .12	$59.95	Semi-scale high-wing sport model; laser-cut balsa and ply; pre-formed aluminum gear
46	11	10.8	.049 to .061	$30	Pink foam construction; includes colored tape covering; combo with Norvel .061 engine available
77	22	8.4	.049 to .09	$116.90	Pink foam construction; includes colored tape covering, Norvel .061 engine, mount, props and hardware
62	14	12.4	.049 to .061	$22.99	Sport delta wing; all laser-cut balsa construction; tabbed rib wing construction
07	12	8.3	.049 to .061	$34.99	High-wing sport model; box fuselage with built-up wing; all laser-cut balsa construction
16	19	8.7	.049 to .051	$34.99	High-wing trainer; all laser-cut balsa construction; tabbed rib wing construction
70	29	15.5	.09 to .15	$34.99	Sport-scale aerobat; built-up wood fuselage; partially sheeted foam wing; includes aluminum gear and plastic cowl
55	22	7	.049 to .061	$99.99	Powered glider; fiberglass fuselage; factory painted and covered; combo available w/BigMig Sport .061 engine
25	23	10.2	.061 to .074	$149.99	Sport seaplane; fiberglass fuselage; factory painted and covered; combo available w/BigMig Sport .074 engine
65	24	13	.049 to .061	$74.99	High-wing trainer; factory covered and 90-percent assembled; several combos w/Norvel engines available
65	24	13	.049 to .074	$79.99	Low-wing sport model; factory covered and mostly assembled; combos with Norvel engines available
65	24	13	.049 to .061	$74.99	High-wing trainer; factory covered and 90-percent assembled; several combos w/Norvel engines available
23	30	10.2	.049 to .15	$46.99	High-wing trainer; pre-cut all-wood structure
12.5	20	13.6	.049 to .051	$44.95	Low-wing sport model; balsa and ply construction; formed aluminum gear; aileron and elevator control
24	22	9.8	.049 to .07	$79.95	High-wing vintage-style sport model; laser-cut balsa and ply construction; molded wheel pants
38	26	11.1	.09 to .19	$37.99	Aerobatic sport model; balsa and plywood construction; several combos w/Norvel engines available

Lanier 1/2A Shrike; $22.99.

Several */2A models, such as this Clancy Aviation Stagger Bee ($84.99), come with provisions for both ViA and electric power. Even if not specifically designed for it, models can be easily converted from one type of power system to the other.

Herr Engineering Aqua Star; **$68.95.**

Hacker Mantis ARF; $149.99.

Hacker TL-96; $109.99.

Hacker Osprey X28-G; $244.99.

SULLIVAN SAVES THE DAY FOR 1/2A

Sullivan has been a reputable name in the hobby business for over half a century, and it has provided tools and accessories that have contributed in one way or another to the operation of just about every type of model airplane flying today! Two of its most recent products fill a definite need for the V2A community: small silicone tubing for V2A engines and a Glow Plug Igniter Adapter that matches the popular igniters to the Norvel and Cox engines.

The operation of the Glow Plug Igniter Adapter couldn't be simpler or more reliable; the connection to the plug is a spring-loaded clip that conforms to engines of any size and stays connected to the engine until you remove it. The other end of the adapter is a plug that locks into the igniter, essentially converting it into the battery supply for the spring clip. The adapter is practically foolproof and costs just $7.95.

The Sullivan Glow Plug Igniter Adapter makes it a cinch to start any 1/2A engine with your existing plug igniter. Just plug one end into your igniter and clip the other end onto your glow plug. Price: $7.95.

With Sullivan 1/2A fuel tubing, you never have to worry about your fuel line slipping off the inlet fitting. Price: $1.89.

The fuel tubing costs only $1.89 and ends the struggle to find tubing that has a less than %2-inch inside diameter. Thank you, Sullivan! +

SOURCE GUIDE

Ace ***Hobby Distributors,*** *2682 Walnut Ave., Tustin, CA 92780; (714) 544-0633; www.acehobby.com.*

AP *Engines; distributed by Global Hobby Distributors.*

Clancy Aviation; *distributed by Global Hobby Distributors.*

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Fuji; *distributed by RJL Industries USA, P.O. Box 5, Sierra Madre, CA 91025; (626) 359-0016; fax (626) 301-0298; www.mecoa.com.*

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Thunder Tiger; *distributed by Ace Hobby Distributors.*

Florida JETS

'by Rich Uravitch

OK; it's the end of February, and you're looking for a warm place to go before the temperature starts to rise in your hometown. That you are an avid RC modeler who wants to broaden your horizons to include jet modeling makes the decision a no-brainer—Florida Jets. Once again, the site for this premier jet event was the Flagler County airport, about five minutes west of Interstate 95 in Bunnell, FL.

I arrived early Friday morning to see cloudy, drizzly skies, and this was as nice as it got for the next 48 hours, i watched about a dozen flights through the mist before I called it quits, hoping for better weather the next day. Unfortunately, it only worsened; no one got airborne Saturday because of the deluge of rain and gusty winds.

But as if to offer a reprieve, Sunday opened with chilly but sunny skies and minimal wind nearly down the centerline-a dramatic difference from the previous two days.

This is John Christensen with his smart-looking L-1011, built from the PCM Models kit The ATA livery was beautifully executed.

One of two Kerry Sterner-designed Rutan ARES at the meet, Jay Smullen's model featured a matte black color scheme like the full-scale version seen In the movie "Iron Eagle II."

FLYING TIME

A few aircraft always stand out in your mind as exceptional in performance, appearance, creativity, or just plain talent. Dave Malchione's big, orange, NMC-marked F-4 Phantom remains a crowd-pleaser. When he touched down on the numbers in a perfect attitude, all that was missing were the blue/gray puffs of smoke from the tires!

As is usually the case at jet events, the majority of the models were from the Bob Violett Models (BVM) product line; there's no question that BVM has captured the lion's share of the jet market. The newest scale machine from the BVM jet house is the F-100F Super Sabre. It has all the appeal of Bob's "D" model, and he reports that it flies even more smoothly. Watching it fly is awe-inspiring. Even with all the external features such as Bull Pups, Mk.82s and other goodies, it really cooks. What Bob has not yet managed to capture is the sound of his "D" model; if you've heard it, you know what I mean. It's magical! Bob confided that he has actually tried switching some external things around trying to determine what is producing that fabulous noise. I sure hope he finds it!

This Malchione F-4J Rhino from the BVM kit Is a Florida Jets veteran and continues to be Impressive—not to mention highly visible!

Jet action burns up the Sunshine State

Marc *Frohm of Germany built this amazing JetCat-powered Eurofighter from a FiberClassics kit His demo flights mirrored full scale—In close, with a wide speed envelope.*

Here Is one of the Kramer boys' BVM Bandits; both are outstanding, with flawless finishes performance to match.

Gustavo Campana brought his Impressive L-159 all the way from Argentina. In nearly any size, this Jet flies extremely well and can be finished In a variety of paint schemes for the scale enthusiast.

PHOTOS BY RICH URAVITCH

Here's one of Jerry Keller's two large Hawker Hunters on Its final approach. It's powered by an AMT turbine engine and weighs 32 pounds.

*The Dassault Falcon 10 is an unusual subject, but it was very well executed. Scratch-built by Tim Davis of nearby Jacksonville, FL, this aircraft is powered by a pair of **RAM** 500s. Unfortunately, it had mechanical problems and didn't fly at the meet.*

Eddie Weeks, who in years past has shown up with a pair of giant DC-lOs carved from foam and powered by two turbines each, treated us this year to an air vehicle simply called "The Rig." It's a 33-pound, turbine-powered AT450 vertical takeoff and landing (VTOL) model. It uses electric motors with props at the extremities for stabilization. Although I didn't see it, sources tell me that it actually does VTOL and hover nicely. Eddie's model is very innovative and is the kind of thing we've come to expect from him. I've no doubt that other projects like this are lurking in the wings; it surely is an exciting time for jet modelers!

Among the standouts in flight performance was Stephan Voelker flying a large-scale Czech Albatross L-39. This guy is a World Jet champ, and it shows. His flying routine kept the model in close and was very impressive, not unlike full-scale aerobatic demos seen at the Paris Air Show and Farnborough.

Ali Machinchy was equally proficient at driving Alan Cardash's Big Boomerang around the patch. This P120-powered machine was absolutely amazing to watch as it routinely performed 15-foot take-offs and 50-foot full-stop landings. What occurred between those two events was unbelievable; picture an IMAC event with 40 percent Extras and CAPs doing their routines. Ali made the same type of presentation with this yVi-foot-span sport jet! It's capable of rolling circles, tail slides and inside and outside snaps, plus it has unmatched slow-flight qualities.

On a more conventional sport-jet note, Jason Somes borrowed Bob Wilcox's Hot Spot—and probably a huge quantity of JP-4—and proceeded to fly almost all day. Even on Friday, with a lot of overcast, the Hot Spot could be seen flat spinning slowly down from just below the cloud deck; then, it stabilized and accelerated to some of the lowest passes I've ever seen.

Marc Frohm's Eurofighter from the FiberClassics kit showed its wide speed envelope with everything from remarkable high-G maneuvers

SPECIAL ACHIEVEMENT AWARDS

Award	Recipient	Model	Sponsor
Designer Achievement	Kerry Sterner	ARES	Bob Violett Models
Manufacturer Achievement	SimJet	700 turbine	*Model Airplane News*
Best Sport Jet Performance	Jason Somes	Hot Spot	JetCat USA
Best Military Performance	Stephan Voelker	L-39	Malcom Kay Models
Best Military Pre-1960	Sam Snyder	MiG-15	R.A. Microjets
Best Military Post-1960	Bob Violett	F-100F	Airtronics
Best Sport Jet	Larry Kramer	Bandit	SWB Turbines
Best Civilian Jet	John Christensen	L-1011	Frank Tiano Enterprises
Best Ducted Fan	Glenn Roberts	Viper	SimJet
Best Multi-performance	Jack Diaz	Rafale	PCM Models
Engineering Excellence	Eddie Weeks	The Rig	AMT USA
Critics Choice	Bob Violett	F-100F	*Zap/Model Airplane News*
Critics Choice (runner-up)	Gustavo Campana	L-159	*Zap/Model Airplane News*

This giant sport jet was designed by Alan Cardash and impressively flown by Ali Machinchy. The "Big Boomerang" demonstrated IMAC-type routines.

to an almost stopped, high Alpha slow-flight demo that was amazing to watch. All of this was performed within a small area and below the low overcast deck.

VISUAL TREATS

Attendees of this event were also treated to a number of models that were appealing from a purely visual standpoint, either because of the subject itself or the unique way it was presented. Some of the prettiest sport jets you can imagine were on hand, and it was clear that these guys were more than willing to trade scale detailing time for paint application and preparation hours. Typifying the breed were the BVM Bandits by Vern and Larry Kramer, impeccably done in "Red Baron" and "Miss Budweiser" schemes. Larry's "Red Baron" has more than 325 flights on it, and it still looks better than many newly finished models. The finishes on some of these jets were absolutely flawless, and the color schemes were exciting, dramatic, highly visible and, in some cases, practically works of art.

Pat McCurry's (PCM Models) new AV8TR turbine trainer might just be the entry point for turbine beginners. It features all-wood, simple construction and fixed gear. Pat's prototype was even MonoKote-covered. Although it didn't fly at the meet, I was told it flies well and might end up being the Ugly Stik of the jet movement!

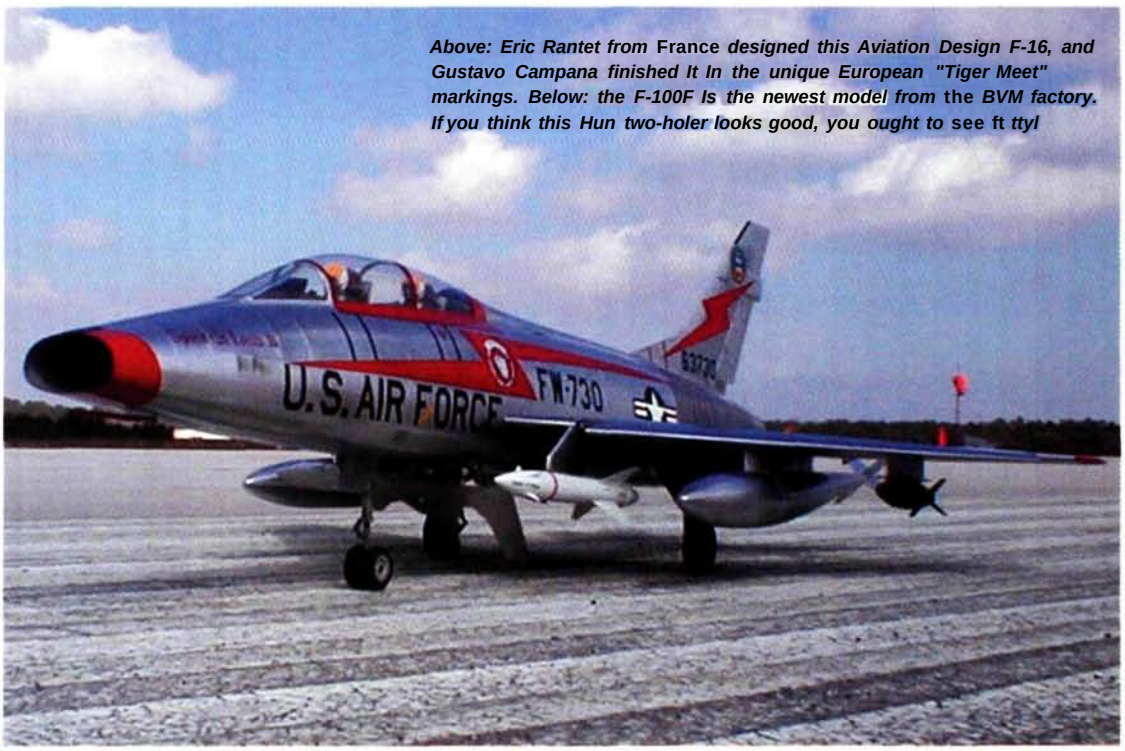
Erich Himmler and Viktor Casut, both from Switzerland, fielded a pair of gorgeous D.H. Venom Mk.ls, which performed beautifully. The detailing was superb, the finish was excellent and the flight speed was just right; further proof that larger models, both sport and scale, are becoming more popular.

Large, unorthodox and slippery-looking was the Rutan ARES designed and developed by Kerry Sterner. This Simjet 2300-powered model weighs just under 24 pounds and was one of two present; the other, by Jay Smullen, was finished in matte black as it was in the movie "Iron Eagle II." Since it has been around eight years and has more than 150 flights, Kerry decided to retire the prototype, but word is that it might be released as a kit in the future.

CHANGING TIMES

Florida Jets is now in its sixth year, and this was the third time I attended. All I can say is that the turbine revolution that began three or four years ago is no longer a revolution, but the norm in jet circles; so much so that I only saw three ducted-fan models fly all weekend. This year, a variety of engine manufacturers and importers were represented, including RAM, JetCat, AMT, Simjet and SWB.

The introduction of the new, smaller turbines offers some great opportunities for modelers who want to become involved in jets. A lot of former ducted-fan fliers are letting their models go for very attractive prices because they want to "step up" to the larger turbines. But ducted-fan models' airframes are ideal for installing the new generation of smaller, 11- to 12-pound-thrust turbines.



Above: Eric Rantet from France designed this Aviation Design F-16, and Gustavo Campana finished It In the unique European "Tiger Meet" markings. Below: the F-100F Is the newest model from the BVM factory. If you think this Hun two-holer looks good, you ought to see ft ttyl

Sport Jets such as Mitch Wess's BVNI Bandit wore some spectacular finishes—flawless and very colorful.

Erich Hlmmler's D.H. Venom was one of two at the meet. It has a beautifully executed finish and wonderful surface detail.

Walking through the vendors' display area, I was amazed by just how far this segment of the hobby has come in a remarkably short time. Manufacturers provided all kinds of information and performed quite impressive demos. With turbine operation, you can forget about all that needle-valve adjustment, tuned-pipe length, glow fuel and such; now, you simply hook up a couple of quick disconnect lines for fuel and ignition, hit the start button, and everything happens automatically through the miracle of computer chippery. It's that simple!

THE FUTURE

A number of facts jumped out at me as I thought back over this year's event. The first is that scale airplanes continue to get larger. The Aviation Design Su-27 and L-39 Albatross as well as the FiberClassics Eurofighter offer clear evidence of this trend. The reason is easy to understand: bigger models fly better, and now, more than adequate power is available. Also, more "off-the-shelf" component availability is making a greater number of jet subjects "model-able." Did you ever think you'd see a 9-foot, largely composite A-10 or A-37? Well, they're here! Given the fact that the jet guys are among the most creative in the RC hobby, it stands to reason that we are seeing—and will continue to see—some really exciting stuff.

This is Bob Violett's "personal" F-4J model. It's finished in Blue Angels markings and is equipped with a smoke system. Here, it's just about to touch down.

This may be the Ugly Stik of the turbine world. Pat McCurry's prototype AV8TR, all-wood kit is simple to build, and turbine installation is a snap. It's also finished in MonoKote. What could be easier?

The colorful Su-27 Flanker from the Aviation Design kit is large, impressive and flies extremely well.

We've now reached a point where turbine operation can be considered nearly routine. This was proven when Jeff Seymour of SWB Turbines walked me through the auto-start procedure for SWB's new Mamba turbojet engine. This is clearly a one-button operation! Throttle response is impressive, with transition from idle to maximum power coming in about three to four seconds. This little beauty is one of the newest generation of units; it measures 3.5 inches in diameter and produces up to 11 pounds of static thrust. It's just the ticket for the smaller airframes formerly propelled by the ducted-fan units.

So, where does jet modeling go from here? Good question. It's already becoming more highly specialized than it was before turbines. We've seen turbine prices come down, the variety of available kits expanded, and more modelers get involved. From a technical standpoint, we'll likely see more autostart systems, even more availability of prefabricated, composite airframes, and equipment upgraded to the point at which what we're flying will really become remotely piloted vehicles (RPVs) and unmanned aerial vehicles (UAVs).

CONCLUSION

Anyone who has ever put together a club contest knows that the key to a successful event is promotion and sponsorship. Someone has to provide the prizes, awards, facilities, staffing and everything else. Florida Jets was top drawer all the way, with the lion's share of the sponsorship coming from *Model Airplane News*, Zap, BVM, RAM Turbines, Airtronics, Simjet, JetCat and SWB. The facility was first class, and the contest administration was outstanding. To everyone who came from faraway places like California, Mississippi, Puerto Rico, the UK, Switzerland and Argentina, I applaud you; your participation made it happen. I, for one, can't wait until next year's Florida Jets. 4-

Sig Mfg.

Somethin' Extra ARF

Extra easy ... extra fun

by Jim Onorato

The Somethin' Extra has been providing Sunday fliers with a whole lot of fun for quite some time. Since Sig first introduced it in kit form, its good looks and outstanding flight performance have made it a favorite at RC flying fields all over the world. Now you can get it into the air more quickly than ever. The almost-ready-to-fly (ARF) Sig Somethin' Extra is the spitting image of its predecessor. It has the same strong, lightweight design and flying capabilities of the original, but this one comes 90 percent built, right out of the box. The Somethin' Extra ARF is expertly covered with Oracover and is offered in two color schemes: white and bright red and white and violet.

WHAT'S IN THE BOX?

Like many of today's high-quality ARFs, the Somethin' Extra comes with just about everything you'll need to get flying except the radio, engine, prop, fuel tubing and pilot figure—which is, of course, optional. The major components come built up and already covered. In addition, the package includes color-matched fiberglass wheel pants, wheels, sturdy aluminum landing gear, a clear molded canopy, a fuel tank, an engine mount, a spinner, tail-support wires and a unique tube wing-mounting system. It also comes with a complete hardware package of high-quality parts and an 18-page assembly manual filled with plenty of photos, sketches and detailed assembly instructions. This is a first-class package that's built to the high-quality standards we've come to expect from Sig kits.

ASSEMBLY

Before you begin assembly, cover your workbench with an old blanket or foam pads to prevent denting or scratching the precovered parts. Remove any wrinkles in the covering with a cloth-covered heat iron. You can also use a hobby-type heat gun to reshrink the covering, but you must be very careful around any seams or color joints. Reheating seams will cause them to "creep," and this can make them unsightly. This is especially true with the Somethin' Extra's trim scheme and pinstriping.

WING

Assemble the wing first. The two wing panels are practically ready to use. You have only to install a servo in each panel, hinge the ailerons and attach the control horns and linkages. The CA-type hinges have a die-cut center slot that, according to the instructions, is supposed to be used to center the hinge equally into both the wing panel and the aileron. Here, I chose not to follow the procedure presented in the manual because I felt that placing the hinges with the slot parallel to the hinge line, as instructed, would have left each with an effective hinge width of only about M inch. Instead, I oriented the hinges with the slot perpendicular to the hinge line and used a pin to center the hinge. This not only uses the full width of the hinge but also allows the Zap CA to wick along the slot and into the wood.

The Somethin' Extra's plug-in wing panels are a nice feature; you usually see them only in much larger planes. This obviously eliminates the need to glue the wing halves together, and having the wing in two pieces makes for easy transportation and storage. The wing halves are slipped onto an 1/16-inch-diameter aluminum tube and are held in place with a no. 64 rubber band looped over J-hooks

PHOTOS BY WALTER SIDAS

SPECIFICATIONS

MODEL: Somethin' Extra ARF

MANUFACTURER: Sig **Mfg. Co. Inc.**

TYPE: aerobatic ARF

WIN6SPAN: 51.5 **In.**

WING AREA: 614 sq. in.

LENGTH: 48.25 in.

WEIGHT: 5 lb., 7 oz..

WING LOADING: 20.4 oz./sq. ft.

ENGINE REQ'D: .40 to .46 2-stroke or .56 to .65 4-stroke

ENGINE USED: Saito FA-56 Golden Knight 4-stroke

FUEL USED: 15% Red Max

RADIO REQ'D: 4-channel w/5 servos

RADIO USED: JR XP8103 transmitter, NER 549X receiver and five NES-537 servos

PROP USED: 11x7 Master Airscrew

STREET PRICE: $199.99

FEATURES: built-up balsa and lite-ply construction; expertly covered with Oracover; offered in two color schemes; kit includes color-matched, painted fiberglass wheel pants and all of the necessary hardware; plug-in wing panels; formed aluminum landing gear.

COMMENTS: this well-thought-out ARF is extremely user-friendly. The Somethin' Extra ARF is the spitting image of the kit version, and It flies just as great.

HITS

- Excellent flight performance.
- Great overall appearance.
- Ease of assembly.
- Complete hardware package.

MISSES

- Hinge installation is incorrect (see text).

threaded into the root ribs—simple and neat!

FUSELAGE

The fuselage comes with the removable canopy hatch in place. To remove the hatch, simply lift it up at the front and slide it forward. The locating dowel pin has already been installed in the rear of the hatch. There are 17 small openings in the fuselage that are covered and should be opened with a no. 11 hobby-knife blade. The instructions show where all the openings are. When that was complete, I test-fit the wing to the fuselage and glued the antirotation dowel into place.

Next, I prepared the fuselage to accept the stab and fin by removing the spacer blocks that protect the covered fillet blocks at the rear of the fuselage. Since the covering material had already been removed from the stab and fin in the areas to be glued, it was easy to epoxy them into place.

Both the stab and have factory-prepared holes for the tail braceOopened these with a metal pick and installed the braces using the provided hardware. After joining the elevator halves with the prebent elevator joiner wire, 1 hinged the elevator and rudder and attached them to the fuselage along with the tailwheel.

1 added a Williams Bros. 256-inch civilian pilot figure and attached the clear canopy with the four screws and silicon washers provided. The more I got into this project, the more I realized just how much thought went into making the Somethin' Extra user-friendly. Most of the holes had already been drilled, including those that accept the four special shouldered silicon washers that help isolate the canopy from vibration. (Do not drop these washers; 1 speak from experience when I tell you that they are extremely difficult to find.)

Next, I attached the wheels and wheel pan ts to the aluminum landing gear and bolted tne assemmy to tne fuselage. The finish on the fiberglass wheel pants was excellent; they matched the Oracover perfectly. Again, all the necessary hardware was provided.

FUEL TANK AND ENGINE INSTALLATION

The installation of the fuel tank and engine came next. I assembled the tank and installed it in the fuselage. The shape of the tank and the cutouts in the bulkheads required that I insert the tank upside-down and then rotate it into position. The Somethin' Extra comes with a 4-piece motor-mounting assembly, but I used only the two beam pieces. I did not need the two base pieces for the Saito FA-56 Golden Knight 4-stroke that 1 chose to install. Other engines may, however, require them.

I installed the Saito upright and fitted it with an 11x7 Master Airscrew propeller.

The Somethin' Extra comes with a four-piece motor mount, but the Saito FA-S6 only required the use of the two beam pieces. I installed the engine upright and then fitted it with a Master Airscrew prop and a Tru-Turn spinner.

Though the kit includes a white plastic spinner, I chose to use a 2 1/4-inch aluminum Tru-Turn spinner instead.

RADIO INSTALLATION

I mounted three JR NKS-537 standard servos on the factory-installed servo tray, and using the hardware provided, made up the rudder and elevator pushrods and the throttle cable. The pushrod and cable tubes were already installed in the fuselage, as was an internal receiver antenna tube, which exited the bottom rear of the fuselage.

I wrapped the receiver in foam and mounted it in front of the servos on the servo tray. I then wrapped the receiver battery in foam and placed it beneath the servo tray. The CG came out 3⅛ inches behind the leading edge of the wing, as the instructions recommended. I centered the ailerons using the gauge provided, and following the instructions, I set the high and low travel amounts for all of the control surfaces. The Somethin' Extra can be flown with a 4-channel radio and 5 servos, but I chose to use an 8-channel JR computer radio so that I could set up the ailerons on independent channels and use them as flaperons. This also provided me with elevator-flap mixing for more aggressive maneuvers. Last, I applied the "Somethin' Extra" decal to the top of the left wing.

CONCLUSION

I found Sig's Somethin' Extra to be a well-made ARF that went together easily and had a pleasing appearance when completed. The folks at Sig did a fine job on this one; they incorporated a lot of little things that make it very builder-friendly. I was eager to check out the plane's flying characteristics, and I was not disappointed. 1 liked everything about this one! ±

I installed all of the radio gear by following the instructions, and the CG came out exactly as recommended. The removable canopy hatch comes already in place on the fuselage; removing it is simply a matter of sliding it forward at the front and lifting it up.

The Sig Somethin' Extra comes nearly complete and with everything you see here. Note the excellent Oracover covering; it's also available in a bright red and white color scheme.

Horizon Hobby Inc., *4105 Ficldstoiw Ril., Champaign, II. 61X22; (H(X» 338-4639; fax (217) 355-1552; www.horiy.onliobby.com. JR; distributed by Hori/.on Hobby Inc.*
Master Airscrew; *distributed by Windsor Propeller Co., P.O. Box 250, Runcho Cordova, CA 95741-0250; (916) 631-8385; fax (916) 631-8386; www.niasterairscrew.com.*
Red *Max; a division ofl'HS Supply Inc., 244 Bethel Hill Rd., P.O. Box 9, Clover, SC 29710; (800) 742-8484; fax (803) 222-7285; www.mcmbers.aol.com/l'HSoil/RedMax.html.*
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Tru-Turn; *distributed by Romeo Mfg., P.O. Box 836, South Houston, TX 77587; (713) 943-1867; fax (713) 943-7630; www.tru-turn.com.*
Williams Bros., *1119 Los Olivos Aw., Unit #3, Los Osos, CA 93402; (805) 534-1307; fax (805) 534-1366; www.williamsbrosinc.com.*
Zap Glue, *9420 Santa Anita Ave., Rancho Cucamongu, CA 91730; www.zapglue.com.*

FLIGHT MANUAL

Before the first flight, I set the control settings at the low rates specified in the instructions, and after checking out the controls, I ran a full tank of fuel through the new Saito engine. I then taxied around a bit to see how the Somethin' Extra handles on the ground, and there were no problems; control is positive on the ground with no bad habits and no tendency to nose over.

TAKEOFF AND LANDING

I turned the Somethin' Extra directly into the wind and advanced the throttle smoothly. It takes off in very little space and gains altitude quickly. With just a touch of down-trim, the Somethin' Extra flies straight and level.

Landing the Somethin' Extra is also super easy. Without using the flaperons, approach the end of the runway with a little power on the engine to maintain a moderate speed and simply fly the model right down to flare height for smooth wheel landings. Using the flaperons will produce similar results but at a much slower speed and with significantly more accuracy.

LOW-SPEED PERFORMANCE

The plane flies safely at low speed without much reduction in control response. To stall it, the Somethin' Extra has to be slowed almost to a stop. Obviously, you always want to take your plane to a safe altitude before you check its stall characteristics because every model behaves differently. The thickness of the Somethin' Extra's wing allows it to slow way down as long as you have power but does not allow it to penetrate very well in high-wind, dead-stick conditions. If the engine quits, get the nose down and the speed up.

HIGH-SPEED PERFORMANCE

Powered with the Saito FA-56 engine, the Somethin' Extra flies at a respectable speed, but it isn't a bullet. It tracks well at all speeds with no tendency to tip-stall. The Somethin' Extra's high-speed flight characteristics can best be described as smooth and predictable.

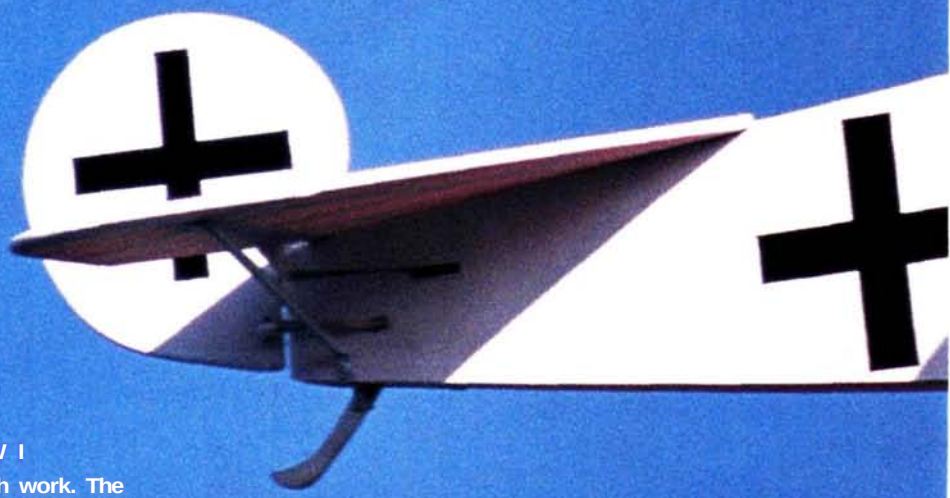
AEROBATICS

At low rate, the Somethin' Extra is as sedate as a trainer, but when I switch it to high rate, it's an altogether different airplane. This plane will perform maneuvers that are not even named yet. Its roll rate is almost too fast to count, and its snap rolls are crisp and nearly violent. It enters upright or inverted spins easily, and recovery is instantaneous when the controls are released. It will knife-edge forever and does a tumbling act that's hard to describe. I really have a blast flying this one!

Arizona Model Aircrafters Fokker Dr.I

by David Johnson

In the past few years, there has been a tremendous resurgence of interest in WW I aircraft. The Fokker tripiane is among the most popular and recognizable aircraft of that era. The plane is most closely associated with WW I's leading ace, Manfred von Richthofen—"The Red Baron." In speaking with spectators at various events, I've found that most modelers would love to own a WW I model, but many believe they are too much work. The Arizona Model Aircrafters' Fokker Dr.I is your chance to own a red tripiane just like Richthofen's, with a minimum of fuss.



WW I three-wing ARF

SPECIFICATIONS

MODEL: Fokker Dr.I

TYPE: Vs-scale fighter ARF

MANUFACTURER: Arizona Model Aircrafters

WINGSPAN: 62 in.

LENGTH: 44% in.

WEIGHT: 6 1b.

WING AREA: 1,248 sq. in.

WING LOADING: 11.1 oz/sq.ft.

ENGINE REQ'D: .46 to .56 4-stroke

ENGINE USED: O.S. .52 4-stroke

PROP USED: Zinger 14x4

RADIO REQ'D: 4 channel w/5 servos (ailerons, rudder, throttle and elevator)

RADIO USED: JR

FUEL USED: Ritch's Brew 15% nltro

PRICE: $279 (basic ARF kit); $65 (optional scale detail package).

FEATURES: almost-ready-to-fly; fabric-covered; painted fiberglass cowl; complete hardware package; vinyl decals; includes wheels, guns and dummy engine.

COMMENTS: this plane flies really nicely. It has a reasonable scale appearance, and it goes together easily.

HITS
- Good appearance.
- Excellent flight performance.
- Can be assembled very quickly.

MISSES
- Main landing gear not shock absorbent.
- Vague radio-installation instructions.

I set the elevators to have 1 inch of travel in each direction and the ailerons to have 3/4-inch travel. I gave the rudder as much throw as I could without its binding. These exceeded the manufacturer's recommendations, but I like authoritative control of the airplane.

TAKEOFF AND LANDING

On takeoff, I point the nose down the runway while holding some up-elevator to keep the tail down. I roll the throttle open and gradually let out the up-elevator. By the time I get to 3/4 throttle, the plane is flying! On its first flight, it required only a few clicks of down and left trim.

The Fokker Dr.I proved to be equally uneventful when landing. The only difficult part is getting it to come down. Three-point and wheeled landings are equally easy; just stay on the rudder during rollout.

LOW-SPEED PERFORMANCE

This is where the triplane really shines! It remains smooth and responsive all the way down to stall. When the stall finally comes, the plane remains relatively straight, with only a slight drop in the right wings. With the application of a little power, it easily recovers. Walking-speed figure-8s at head level just over the runway are very enjoyable to fly; no drama is involved.

HIGH-SPEED PERFORMANCE

The O.S. .52 4-stroke engine does not really provide this triplane with significant high-speed abilities. Full throttle increases the climb rate more than anything else. The plane displays no bad habits at maximum power.

AEROBATICS

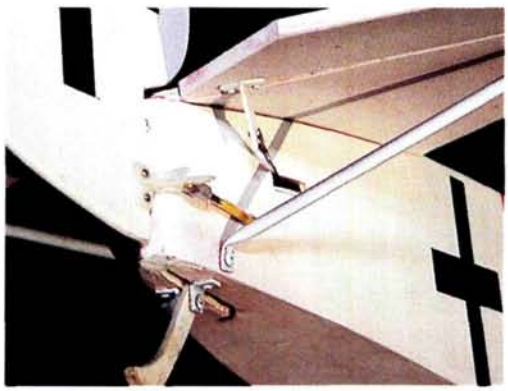
The triplane will never be confused with an I MAC plane, but it will perform any maneuver the original could. Loops, rolls and split-S's are all well within its capabilities. My personal favorite is a skidding, flat turn; it can be accomplished within a 10-foot diameter. The full-size plane used this maneuver to great advantage during dogfights. Overall, this plane is a blast to fly.

WHAT DO YOU GET?

When I opened the box, I found a nicely fabric-covered, sport-scale Fokker Dr.l. When I looked through the contents of the box, I found that it included the plane, a dummy engine kit, machine guns, a painted fiberglass cowl, vinyl decals and a very complete-looking set of hardware. I could no longer control my enthusiasm, so I got busy at once! Within 40 minutes of opening the box, I had an assembled triplane sitting on its wheels.

ASSEMBLY

To make sure I got it right, I began by reading the included instructions. As 1 stated before, there really is not a tremendous amount of work involved in getting this plane ready to fly. I began by hinging and installing the ailerons and elevators. The hinges were among the few parts not included in the package. I chose to use medium Robart hinge points.



The kit includes all of the necessary linkages to assemble the control system. I devised my own method of hooking up the elevator-control surfaces. The Fokker comes with some cable for a pull/pull control system on the rudder, but I elected to use Nyrod instead.

The triplane's wings all come in one piece and can be easily attached with the supplied metal bolts. The cabane struts and interplane struts are also formed and ready to bolt into place with small L-brackets and screws. The landing-gear wire is already bent to shape; all you have to do is insert the wires into the mounting slots in the bottom of the fuselage and into the sub-wing fairing between the wheels and then secure them with the supplied straps and screws.

The Fokker was designed for both electric and glow power; I chose to install this O.S. .52 4-stroke. The size of the plane and the number of wings may tempt you to install a larger engine. Resist the urge!

The instruction sheet was a bit unclear about how to install the tailskid; it simply said to install the tailskid and spring with the supplied bungee. A quick call to the folks at Arizona Model Aircrafters cleared everything up. The tailskid should be installed with the supplied angle brackets and screws. Next, attach the hooks to either side of the fuselage and then attach the spring to the skid by running the bungee through it and looping it around the hooks. Arizona Model Aircrafters did inform me that I had received an early version of the model and that the directions have since been modified.

ENGINE INSTALLATION

This is the only part of the assembly that might be difficult for a beginner. I elected to use an O.S. .52 4-stroke engine in my plane. Because this is a good-size plane with a lot of wings, it took a great deal of willpower to resist the urge to install something larger. I suggest that you also resist this urge.

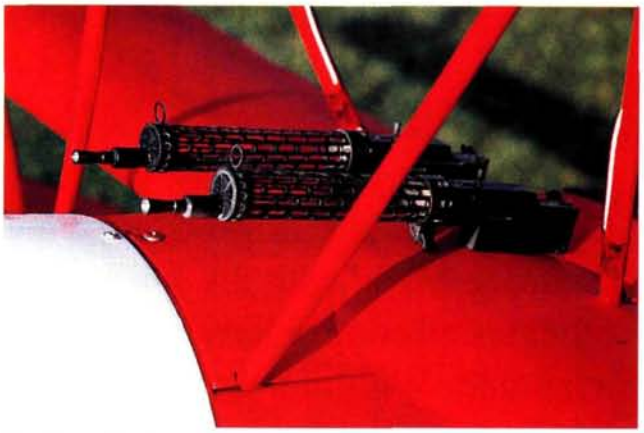
The plane is designed for either electric or glow power, but glow fliers will need to slightly modify the model. You must enlarge the hole in the firewall so that the 4-stroke carburetor can extend back through the firewall—a requirement if the engine is to fit inside the cowl. Laminate the two '/4-inch plywood engine mounts together. While they set, enlarge the center hole of the cowl to fit your engine and mount the cowl on the plane.

Next, set the fuselage upside-down, tape the engine mount into place and mark the exact location of the engine on the mount. Drill your mount holes, attach the engine to the mount and then epoxy the mount/engine assembly into place, making sure to center the engine's crankshaft in the cowl hole. It actually sounds more complicated than it is.

At this time, I modified the plane to

assist in the balancing process. I made a plywood tray and set it in front of the firewall over the engine. This allowed me to place my receiver as far forward as the cowl would allow. Last, I boxed in the carburetor with the supplied pieces. Don't forget to fuelproof these areas.

The dummy engine goes together quickly and easily with the provided laser-cut parts. I assembled the machine guns as directed.



The Fokker Triplane comes complete with these machine guns for added realism. This is a really nice scale touch!

RADIO INSTALLATION

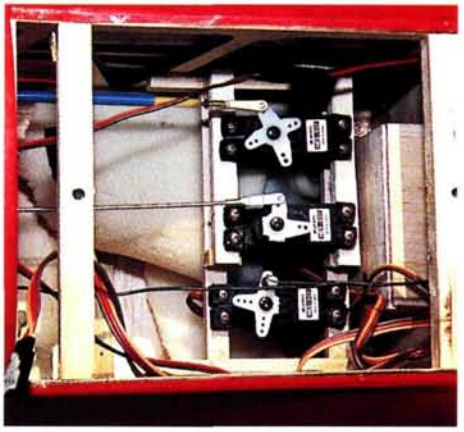
I elected to install a JR radio in my triplane. I began with the installation of the aileron servos. The model came with all of the necessary linkages. The thoughtful folks at Arizona even inserted strings to help pull the leads through. The only problem I had was that a standard-size servo didn't seat flush with the wing. I recommend that you install a mini or a low-profile servo.

1 next installed the throttle, elevator and rudder servos immediately behind the firewall and over the 8-ounce fuel tank (not included). The kit includes dowels to make the pushrods. The directions were unclear about how to hook up the surfaces, so I decided to take the provided dowel and attach two pieces of the included threaded rod to one end with some CA and thread. I then spread the threaded rod to make a "V." Next, I cut slots in the rear of the fuselage to correspond with the length of the elevator horns. 1 then inserted the V-rod through the fuselage and attached it to the elevator horns with the provided clevises. Last, I attached the dowel to the elevator servo using another piece of the provided rod.

The kit includes some cable for a pull/pull control system on the rudder, but I elected to use Nyrod instead. I used the cable and its sleeve to attach the throttle. After I installed the battery and receiver on the tray I made in the cowl area, the model was complete; best of all, it balanced without any added nose weight.

CONCLUSION

The Arizona Model Aircrafters 1/5-scale Fokker Dr.l ARF is a quick and easy way to get into WW I aircraft. The plane is IMAA-legal but is small enough to carry to the field fully assembled. To date, I have let about a half dozen pilots—from rank beginners to experienced veterans—fly it, and all have been able to handle this plane. It provides a reasonable scale appearance with none of the complexity and time required to build it yourself. 4-



To assist *in the balancing* process, *I made a plywood radio tray and set it in front of the firewall. This allowed me to place my radio gear as far forward as the cowl would allow.*

Arizona Model Am rafters, *14715 N. 78th Way, Unit 600, Scottsdalc, AZ 85260; (480) 348-3733; fax (480) 348-3773; wwwMriy.oinitmhMs.com.*

)R; distributed by Horizon Hobby Inc., 4105 Fieltlstone Rd., Champaign, II. 61822; (800) 338-4639; www.hony.otihobby.coin.

OS.; distributed by (ireat Planes Model Distributors Co., P.O. Box 9021, Champaign, IL 61826-9021; (800) 637-7660; fax (217) 398-0008; www.greutplanes.com.

Ritch's Brew, *4104 Lark in., Houston, TX 77025; (713) 661-5458; fax (713) 660-7947; www.ritchsbrew.com.*

Robart *Mfg., P.O. Box 1247, 625 N. 12th St., St. Charles, 11. 60174; (630) 584-7616; fax (630) 584-3712; www.robiirt.com.*

Zinger; *distributed by /&Z Products, 25029 S. Vermont Ave., Harbor City, CA 90710; (310)539-2313.*

Hangar 9

ARESTI 40

Pattern performance with great looks

by Vic Bunze

Mastering the basics of RC flying is fun, but most pilots eventually want to move on to the thrill of aerobatics. The Hangar 9 Aresti 40 ARF is a great-looking plane that's designed to introduce pilots to the world of precision aerobatics. It's an inexpensive, attractive model that sports a nicely applied multicolored finish with a beautifully painted fiberglass cowl and wheel pants.

The sleek lines of the Aresti blend weH with the four-color trim scheme. The model is easy to see during aerobatics. Great for orientation!

SPECIFICATIONS

MODEL: Aresti 40

MANUFACTURER: Hangar 9

DISTRIBUTOR: Horizon Hobby

TYPE: sport aerobatic ARF

WINGSPAN: 56 in.

WING AREA: **565** sq. in.

WEIGHT: **5.85** lb.

WING LOADING: 23.9 oz./sq. ft.

LENGTH: 49 in.

ENGINE REQ'D: .40 to .58 2-stroke or .40 to .72 4-stroke

ENGINE USED: Saito FA .72 4-stroke

RADIO REQ'D: 4-channel with 5 servos (rudder, 2 ailerons, elevator and throttle)

RADIO USED: JR **10X**

FUEL USED: Wildcat 15%

PROP USED: APC 12x8

PRICE: $169.99

HITS
- Outstanding aerobatic performance.
- Excellent instruction manual.
- Nicely finished fiberglass cowl and wheel pants.

MISSES
- No instructions for mounting 4-stroke engines.

FEATURES: built airframe covered with UltraCote; painted fiberglass cowl and wheel pants; tinted canopy; fuel tank with hardware; painted aluminum landing gear; hardware package; photo-illustrated instruction manual.

COMMENTS: the Hangar 9 Aresti 40 ARF Is an easy-to-build aerobatic model that really performs, and Its attractive UltraCote color scheme is easy to see while performing aerobatics. The model's precise handling characteristics are a real confidence builder for the student aerobatic pilot and a joy for the skilled pilot. Give one a try. You'll love it!

PHOTOS BY WALTER SIDAS

KIT FEATURES

The Aresti 40 is well built and comes expertly covered with Hangar 9 UltraCote; the four-color scheme is very attractive and is highly visible during maneuvers. The kit includes a fuel tank with hardware, painted 2-piece aluminum landing gear and wheels, tailwheel and steering assembly, universal aluminum engine mount, tinted canopy, hinges and all the required control-system hardware.

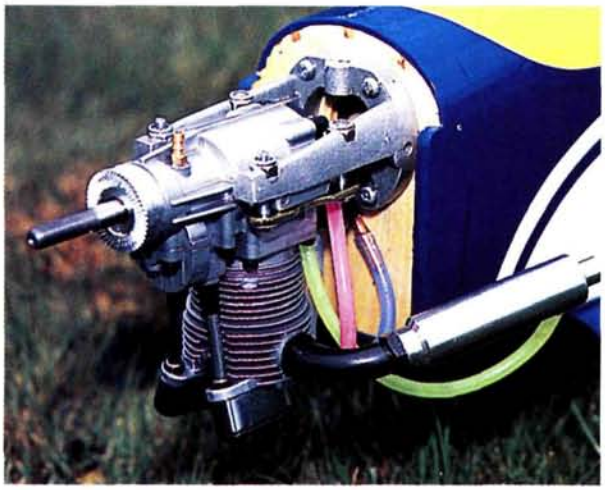
The major parts come individually wrapped in plastic bags, and there were very few wrinkles in the covering. The 42-page instruction manual is chock full of helpful photos detailing the assembly process. It is organized into 20 sections and has three to six clear photographs on each page. It also lists other tools and supplies needed to complete the model.

The Aresti goes together easily and takes only two or three evenings to complete. Assembly is quite typical of today's quality-engineered ARF models and offers no surprises.

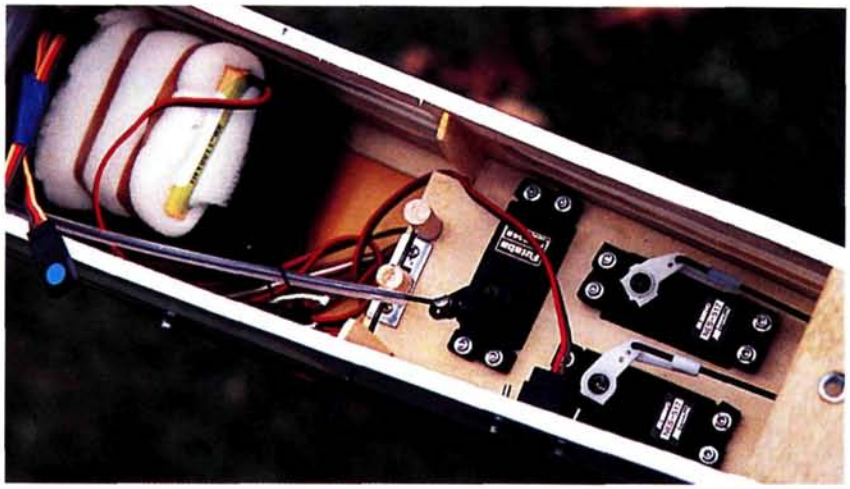
WING ASSEMBLY

All of the Aresti's control surfaces are preslotted, and assembly begins by attaching the ailerons to each wing half using the supplied CA hinges and some thin CA. I joined the wing halves with the 1-piece plywood wing joiner. The joiner is flat on one side and tapered on the other: the tapered side faces forward and slides into a slot in each wing half. The joiner also sets the dihedral angle of 1 $^{x}/_{i}$ inches.

Installing the aileron servos is next. 1 located the necessary hardware, and then cut out the servo openings in the wing. You'll need to supply two 6-inch servo extensions, and the instructions provide a useful tip to help thread the extensions through the wing using a string and a nut to "plumb" it through the wing. After 1 mounted the servos, I connected the linkages from the servos to the ailerons.



The Aresti can accommodate a wide range of engines in the recommended range. I used a Saito FA .72 for stunning performance.



A place for everything and everything in its place. The servo tray is already installed for quick assembly. Note that the battery and receiver are wrapped in foam to protect them from vibration.

Here's how the Aresti 40 comes out of the box.

FUSELAGE

The fuselage is complete out of the box and requires very little preparation. 1 mated the completed wing to the fuselage and carefully aligned it. The leading edge of the wing keys into a fuselage bulkhead, and the rear of the wing is secured to the fuselage by a single '/4-20 nylon bolt that screws into a blind nut.

The 2-piece aluminum landing gear is bolted onto the fuselage bottom with six bolts that screw into pre-installed blind nuts. I bolted the axles onto the landing gear and installed the wheel pants and wheels on the landing gear through an included plywood plate that I laminated to the inside of the wheel pants.

TAIL GROUP

Next, the horizontal and vertical stabilizers are mounted to the fuselage. First, I removed the covering material from the slots in the fuselage and then inserted and aligned the horizontal stabilizer. When 1 was satisfied with it, I removed the covering material from the center section of the stabilizer and epoxied the stabilizer into the fuselage. The vertical fin is mounted using the same process. Following the manual, I hinged the elevators and rudder, installed the tailwheel assembly and added the control horns.

ENGINE, TANK AND COWL INSTALLATION

The supplied universal aluminum motor mount can accommodate a variety of engines, and the Saito .72 I used fit easily. The supplied throttle linkage is a flexible stranded cable that's routed through a plastic guide tube and is attached to the carburetor throttle arm with a screw-lock connector.

The fuel tank fits into the fuselage against the firewall; I set it up using a two-line system and then routed the lines through the firewall and center opening of the engine mount. This opening is

FLIGHT PERFORMANCE

TAKEOFF AND LANDING

After checking out the controls, I started the big Saito and taxied the Aresti out to the center of the runway, where I gradually advanced the throttle and held full up-elevator to keep the tail on the ground while accelerating. As soon as the speed picked up, I neutralized the elevator and held in a touch of right rudder. The Aresti tracked smoothly and predictably and, with slight pull of the elevator, it rotated and began to climb out. I was immediately impressed with the smooth responsiveness of this plane.

With its low wing loading, the Aresti felt very solid and, because of its clean design, it doesn't bleed off speed quickly when landing. To avoid a lot of float after flare, landing approaches should not be too steep or too fast. The Aresti slows down nicely, though, and a gradual application of elevator just before touchdown makes for smooth landings.

LOW-SPEED PERFORMANCE

The Aresti has a low wing loading with generous control-surface area; these help contribute to solid and predictable performance at slow speeds. The model has no tendency to snap at stall and is solidly predictable.

HIGH-SPEED PERFORMANCE

The Aresti is happy at full throttle and remains solid and smooth; it does not attempt to snap out of high-load maneuvers. Top speed with the 12x8 propeller in level flight is about 70mph.

AEROBATICS

This is where the Aresti shines. It is a smooth-tracking plane and has no tendency to go off on its own. In other words, it flies where you point it. It has a fast roll rate on high rates and is very smooth at low rates. Knife-edge tracking is virtually perfect, with insignificant tuck to the wheels or canopy. Spin recovery is immediate, and inverted flight requires only slight down-elevator input. The model's smooth, predictable performance adds tremendously to the fun of practicing precise aerobatics.

properly positioned for an MDS engine, but I found that the opening placed the tank too high relative to the Saito .72's carburetor, so I enlarged the opening to lower the tank.

I fitted the fiberglass cowl to the fuselage and used paper templates that I taped to the fuselage sides as "markers" for the engine exhaust, needle valve and glow-plug access ports. 1 then transferred these marks to the cowl and opened them up using a rotary cutting tool. I made under-size cuts and carefully opened them up to get a perfect-fitting cowl.

There's ample room to dress up the cockpit if desired. The tinted canopy requires minor trimming for a good fit.

RADIO INSTALLATION AND FLIGHT SETUP

Radio installation in the Aresti is easy and well thought out. I assembled the pushrods using the supplied parts and installed the servos, receiver and battery pack. I hooked up the pushrods to the servos and control surfaces, and I used the recommended control throws.

The Saito FA .72 is a smooth, strong-running engine that provides all the vertical performance you could want. I used an APC 12x8 propeller, and it proved to be a good match; it provided a nice combination of vertical performance and good top-end speed.

Because the cowl fits tightly around the inverted engine in the Aresti, I highly recommend a remote glow setup. The rear tilt of the glow plug on the Saito makes it cumbersome to connect a standard glow igniter. A remote adapter solves the problem beautifully and provides the option to add glow heat for idle enhancement.

CONCLUSION

The Hangar 9 Aresti 40 ARF is a classy-looking plane with a no-compromise aerobatic attitude. It is a great sport plane and an excellent model to wring out your aerobatic sequences. It's attractive with its multicolored trim scheme and has good contrast between the top and bottom of the wing. The model goes together quickly, has a fine-quality fiberglass cowl and wheel pants and is a terrific value in terms of looks, performance and excitement at the flying field. ±

APC Props; distributed by Landing Products, 1222 Harter Ave., Woodland, CA 95776; (530) 661-0399; fax (530) 666-6661; www.apcprop.com.

Hangar 9; distributed by Horizon Hobby Inc.

Horizon Hobby Inc., 4105 Fieldstone Rd., Champaign, IL 61822; (800) 338-4639;

fax (217) 355-1552; www.horizonhobby.com.

JR; distributed by Horizon Hobby Inc.

MDS Engines; distributed by Horizon Hobby Inc.

Saito; distributed by Horizon Hobby Inc.

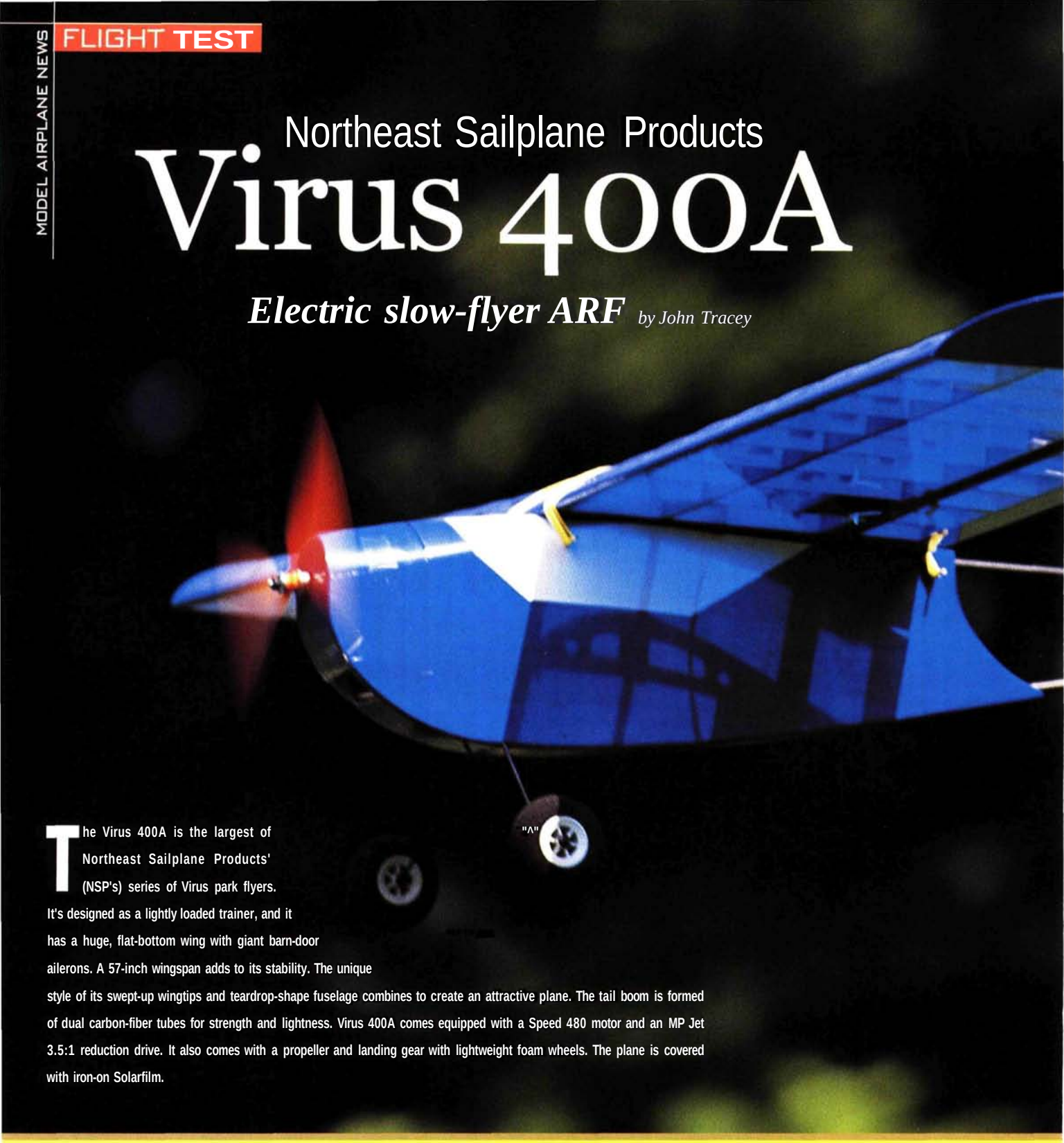
UltraCote; distributed by Horizon Hobby Inc.

Northeast Sailplane Products

Virus 400A

Electric slow-flyer ARF

by John Tracey



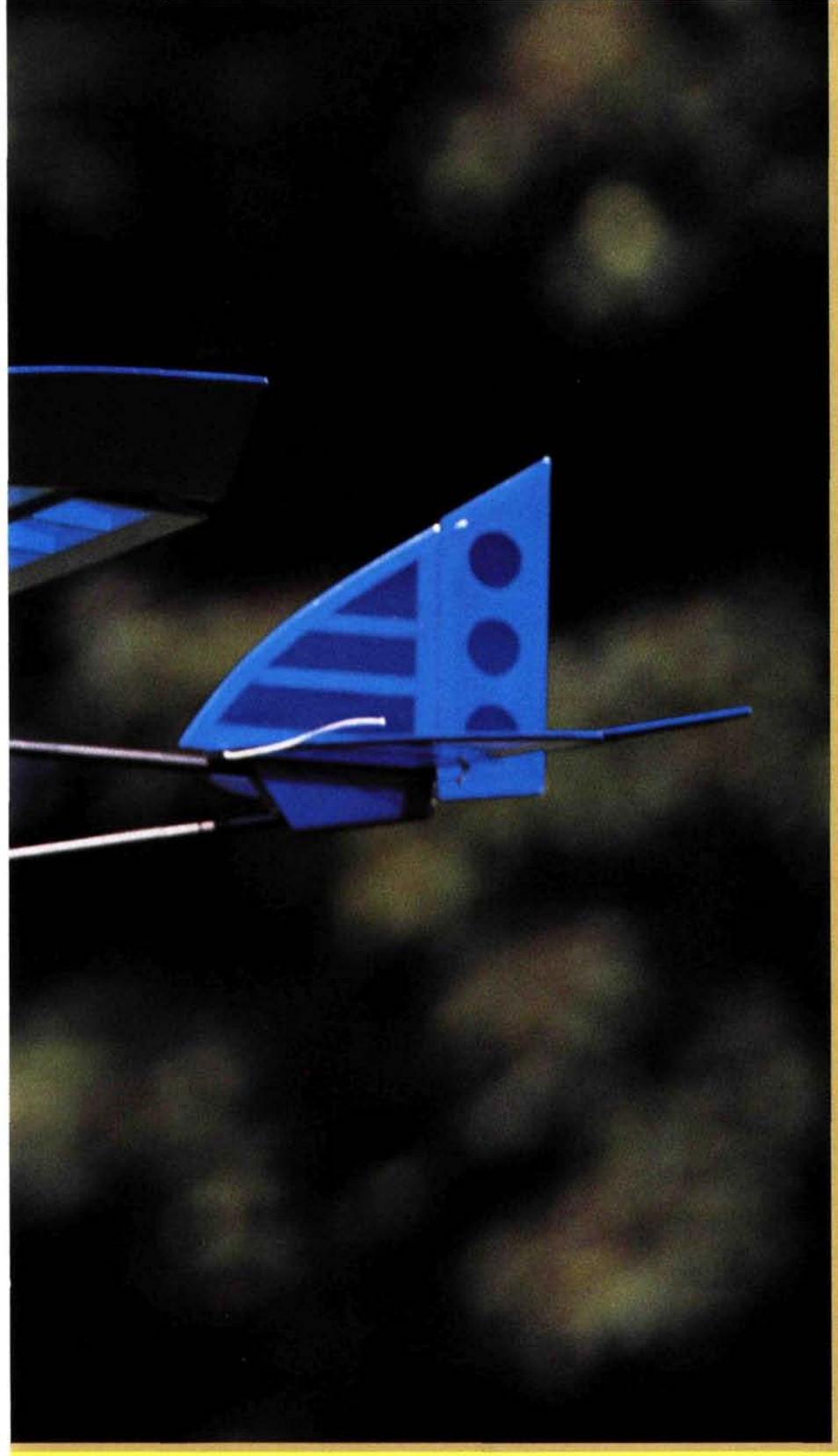
The Virus 400A is the largest of Northeast Sailplane Products' (NSP's) series of Virus park flyers. It's designed as a lightly loaded trainer, and it has a huge, flat-bottom wing with giant barn-door ailerons. A 57-inch wingspan adds to its stability. The unique style of its swept-up wingtips and teardrop-shape fuselage combines to create an attractive plane. The tail boom is formed of dual carbon-fiber tubes for strength and lightness. Virus 400A comes equipped with a Speed 480 motor and an MP Jet 3.5:1 reduction drive. It also comes with a propeller and landing gear with lightweight foam wheels. The plane is covered with iron-on Solarfilm.

WING CONSTRUCTION

Building the Virus 400A is pretty basic; the written instructions include diagrams to help you build the model. A few details are omitted from the instructions, but if you use your common sense, you'll have no problems building the plane.

The first step is to join the wing halves. A small metal rod reinforces the joint between the halves. The rod slips into a small brass-tube sleeve in each wing half. After using 5-minute epoxy to join the wing, I wrapped the joint with clear tape for extra reinforcement. When finished, the wing is more than strong enough for any maneuver this plane will do.

The "A" in Virus 400A stands for "ailerons," and NSP is not kidding. The huge barn-door ailerons account for 30 percent of the wing chord, and each is controlled by an individual servo. One of the advantages of this setup is that it allows the ailerons to be mixed with a computer radio and used as flaperons for very slow landings and short takeoffs. I recommend that you use servos with at least 14 ounces of torque; I used Cirrus CS-20BB Sub Micros. If you don't have a computer radio, you can use a Y-connector to connect the aileron servos to the



SPECIFICATIONS

•MODEL: Virus 400A ^H

•DISTRIBUTOR: Northeast Sailplane ProdtiCT^

•fYPE: sport-flyer ARF

•jVINGSPAN: 57 in.

BfVING AREA: 627 sq. in.

•WEIGHT: 28.2 oz.

•WING LOADING: 6.5 oz./sq. ft.

•pENGTH: 37.5 In.

•MOTOR USED: Speed 480 geared 3.5:1 HI (included)

•PROP USED: APC 10x7 slow flyer (included)

•RADIO REQ'D: 4-channel (5-channel w/flap-•f eron mixing optional), 4 mlcroservos and • ESC (2 aileron, elevator and rudder)

•RADIO USED: Futaba 6XAS w/4 Cirrus •t CS-20BB sub-microservos and GWS *m* GS-400 ESC

•pATTERY USED: 10-cell, 600mAh Ni-Cd

•FLIGHT DURATION: 6 to 7 min.

•PRICE: $159.95

•FEATURES: all components are built and •covered in Solarfllm. The kit includes a carbon-•fiber tall boom, a Multiplex Speed 480 motor, • a n MP Jet gearbox, a propeller, music-wire •jandlng gear, lightweight foam wheels and all •necessary hardware.

•COMMENTS: the Northeast Sailplane Products• |/lrus 400A Is a unique ARF model that's a lot • o f fun to fly. Its wing design allows the model • t o maneuver in small flying areas without tip-•jftalling. When the ailerons are used as •flaperons, the model can be flown extremely •slowly and, because its ailerons are so large, •slow-speed turning is instantaneous.

HITS

• j » Good craftsmanship and easy assembly.
• p * Unique wing design.
•• Good flight capabilities.

•MISSES

•• None found.

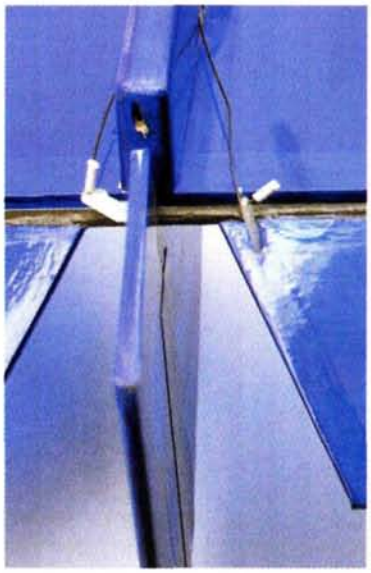
receiver, but you won't be able to use the ailerons as flaperons.

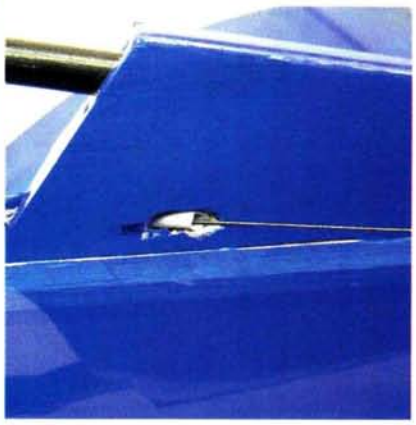
The ailerons are top-hinged with tape, and a large gap on the bottom of the ailerons ensures a lot of travel. I taped the ailerons into a neutral position so they would not move while I installed the hinge tape, and I used SR Batteries Gapless Hinge Tape instead of the recommended tape. When you use it, make sure every-

PHOTOS BY JOHN TRACEY AND WALTER SIDAS

thing is lined up correctly before you secure it; it bonds so thoroughly that it cannot be moved once it has been pressed into place.

You'll need to extend your aileron servo leads to reach the receiver; I cut them and soldered 6-inch extensions between each plug and servo. You can also buy 6-inch servo extensions at a hobby store. I bent the included aileron pushrod wires to size and attached them to the ailerons and servos. I made a V-bend in each pushrod to make adjustments easier.





Above: the pushrods for the rudder and elevator run through the carbon-fiber tail boom. I used plastic sleeves in the tail boom to prevent any metal-to-metal contact, and I replaced the wooden elevator joiner with a stiffer carbon-fiber rod. Above right: the tail feathers are mounted on a balsa block, and the carbon-fiber rods are inserted in the balsa block—a very simple mounting method. Note the pushrod exit. Right: the unique wingtip design adds a lot of stability to the flight characteristics.

FUSELAGE AND TAIL GROUP

The next step is to attach the tail surfaces to the carbon-fiber tail boom. The tail-boom rods are inserted into a balsa block, and the horizontal stabilizer is glued to it followed by the vertical fin. I felt that the wooden joiner for the elevator halves was not strong enough; it flexed a lot and gave more control to one side than to the other. I replaced the wooden joiner with a piece of carbon-fiber rod; with this modification, the elevators moved equally and I was able to perform nice, tight loops. Northeast Sailplane notes that later kits include a stronger elevator joiner, so it should not be a problem.

The pushrods for the rudder and elevator are installed inside the top carbon-fiber tail boom, and I used a Dremel Moto-Tool to cut the exit holes for them at the rear. I inserted two plastic sleeves for the pushrods to slide into so they would not rub against each other and cause radio interference. It would have been easier to install the rods outside the boom, but they look better hidden inside.

I glued the two servo rails in the rear of the fuselage and attached the servos to them. I recommend that you move the rails forward in the fuselage to help attain the proper center of gravity. The kit does not come with a battery tray, but the instructions and diagrams show how to construct one out of ⅛-inch balsa. I used the bottom of the fuselage as a template and made a tray that fit onto the top of the longerons inside the nose of the fuselage. Before I glued the tray into place, I attached a strip of hook-and-loop fastener to it for the battery. I cut a hole in the nose of the fuselage directly under the propeller to access the battery compartment. This makes it easy to change batteries without having to remove the wing.

I inserted the music-wire landing gear in the fuselage and secured it with epoxy. The wheels are made of a lightweight foam with plastic hubs, and their large diameter allows takeoffs from grass fields.

I next assembled the drive system to the model and encountered no problems. To secure the pinion gear on the motor shaft, I first lightly sanded the shaft, added a drop of solder to it with a 100W soldering iron and then pressed the pinion into place. Then I slid the motor into the included MP gearbox and added a couple of drops of thin CA for extra security. This assembly is screwed to the firewall with two screws, followed by the

FLIGHT PERFORMANCE

TAKEOFF AND LANDING

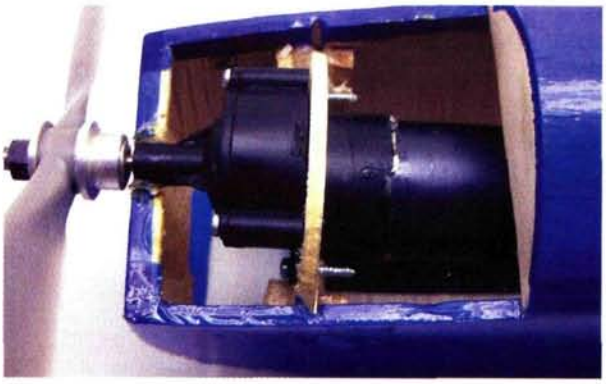
I usually hand-launch my planes to conserve power; despite its large size, the Virus leaves my hand with barely a dip before it reaches flying speed. The Speed 480 provides plenty of power; climb-out is great. I climbed the plane for altitude while I trimmed it out; it is a nice flyer. The high wing and generous wing area allow it to remain stable on approach, and the plane settles in nicely.

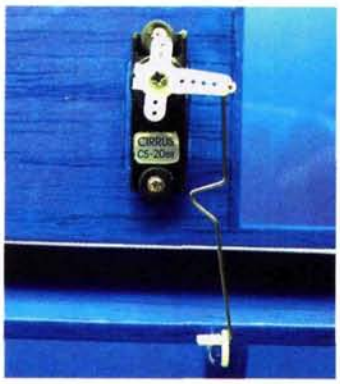
GENERAL CHARACTERISTICS

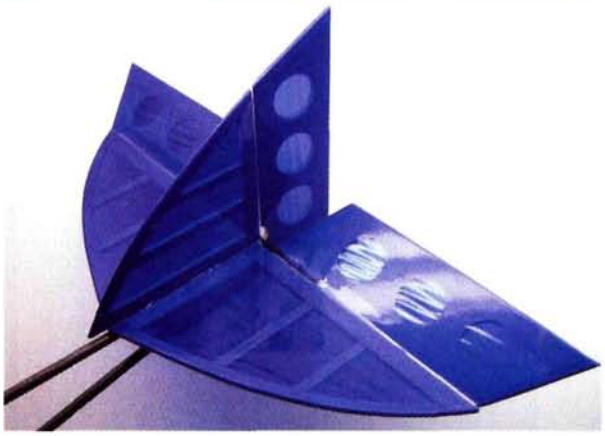
When I had the model trimmed, I brought it down closer to me and realized I could maneuver it easily in a small area. It does everything slow and easy. The larger control surfaces and light wing loading really pay off, and with good throttle management, I can get flights of 6 to 7 minutes. The flight characteristics of the Virus 400A make it an excellent aileron trainer, and the thick, flat-bottom airfoil makes it resistant to stalls at high angles of attack. The turned-up wingtips give the model excellent turning abilities with little chance of stalling. Schoolyards and parking lots are great places to fly this bird.

AEROBATICS

That huge wing with its 6.5-ounce wing loading makes this plane a real floater. The Virus 400A loops very well, but I would not consider it an aerobatic plane. Its large ailerons help it maneuver well, but the wingspan is too big for a satisfactory roll rate.







Above left: motor installation is straightforward and easy. Above right: two servos are used to control the ailerons. This allows you to use them as flaperons if desired. Note the short pushrod; it provides for a solid control system.

The built and covered tail feathers take only a few minutes to attach to the tail boom. I used SR Batteries Gapfess Hinge Tape to hinge all of the control surfaces.

prop adapter and propeller. The Virus 400A was ready for flight.

IN SUMMARY

I have to say that the unique looks and stable flying characteristics of the Virus 400A add up to a very nice plane. When you use the ailerons as flaperons, a whole new spectrum of flying is revealed; slow flight that borders on hovering and takeoffs in only a few feet are just some of the tricks that this model can do. With its large wheels, takeoffs from grass are easily accomplished, and I'm impressed with its maneuverability. The Virus 400A can be flown in tight spaces and makes a great trainer.

APC Props; *distributed by Landing Products, 1222 Harter Avc, Woodland, CA 95776; (530) 661-0399; fax (530) 666-6661; www.apcprop.com..*

Cirrus Ventures, *115 Hunter Avc, f'anwood, Nj 07023-1030; (90S) 322-7221.*

Dretnel Tool, *4915 21st St., Racine, Wl 53406; (800) 437-3635; fax (414) 554-7654; www.dremel.com.*

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Grand Wing Servos GWS); *distributed by Balsa Products, 122]ansen Ave., lselin, Nf 08830-2601; (732) 634-6131; www.balsapr.com.*

Multiplex *USA, 560 Library St., San Fernando, CA 91340; (800) 375-1312; (818) 838-6467; fax (818) 838-3127; www.multiplexrc.com.*

Northeast Sailplane Products, *948 Hercules Dr., Ste. 12, Colchester, VT 05446; (802) 655-7700; fax (802) 655-7755; www.nesail.com.*

Solarfilm; *distributed by Horizon Hobby Inc., (800) 338-4639; fax (217) 355-1552; www.hori/.onhobby.com.*

SR Batteries Inc., *Box 287, Heliport, NY 11713; (631) 286-0079; fax (631) 286-0901; www. srbatteries.com.*

The rear of the fuselage is constructed of carbon-fiber rods. They're lightweight and very strong.

Make Static Scale Props

The ultimate final touch

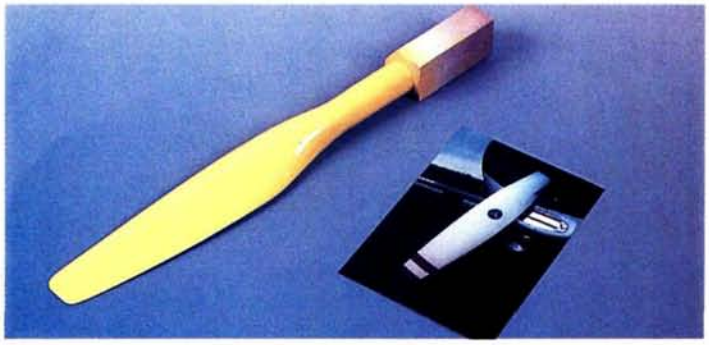
by Dick van Mourik

Whenever I attend a scale meet, I wonder why so many scale modelers spend so much time installing features such as sliding canopies and retract doors, but no one feels the need to upgrade from a plain gray 2-blade 12x6 prop for static judging. The use of static props doesn't have to be limited to the highest competition models; scale propellers are major attractions on any aircraft, and they are more than worth the time it takes to create them.

Constructing static scale props does not require any special talent or equipment beyond that possessed by the average modeler. To help explain the techniques involved, this article outlines the steps I took in the production of the static scale prop for my 1/4-scale Zlin Z-50 LS. Give it a try; you'll be amazed by what you can create with some glass, epoxy and a little practice!

1 A sketch and several photos of the full-size aircraft at various angles provided the basis for an accurate plug. In this case, I was really lucky; the manufacturer of the full-size plane supplied me with factory information as well as a logo and identification sticker.

2j The choice of building materials for the plug depends on the builder's individual preferences. I used a block of hard polyurethane foam. It is vital that you smooth out the foam as much as possible. Any imperfections will immediately show up in the moldings. Careful sanding (start with 400-grit and end with 1200) and polishing will pay off later.



3 A prop blade is not the easiest part to form a mold around. To allow for removal, the molding must be split. I placed the blade on a bed of modeling clay, which I then smoothed out as much as possible. I placed the whole thing on a bearer plate made of plastic-coated fiberboard, onto which I formed the flange.

Be sure that you liberally treat both the plug and the support with release agents. I normally use a combination of two: first, I use a special mold-release wax that I allow to dry for a few minutes before I polish it out. Depending on the plug's finish, I may repeat this process six to 10 times. Second, I carefully apply some poly vinyl alcohol (PVA) to the plug/mold with a soft, wet sponge. (You could also thin the PVA to a milk-like consistency and apply it in a single layer with a dry cloth.) As the water evaporates, it forms a very thin film. Ultimately, it's the wax that ensures debonding from the resin and plug, but this film provides an extra measure of safety. I always use a very thin layer of PVA because any imperfections will clearly show.

4 When the release agents were completely dry, I used a soft brush to gently apply the first layer of molding compound. Molding compound has a high viscosity and should be carefully stirred to allow the hardener to be thoroughly mixed. To prevent air bubbles, I always use a small brush in the corners first. It is best to apply thick layers and avoid retouching the mixture with the brush where it has already been applied. I normally get a decent result from two layers. Brush the second one on after the first layer has hardened but before it has fully cured.

5 When the second coat had hardened to the stage where it is sticky, I poured a mixture of cotton fibers and chopped fiberglass strands over the compound. The strands and fibers ensure a firm bonding between the compound and resin. When it had cured, I used a vacuum cleaner to remove any excess material.

Glass cloth will not take to sharp corners, so I filled these with a mixture of resin, chopped strands and a thickening agent. A generous layer of this mixture will prevent any cloth from showing through. It also helps to flatten out any irregularities in the compound. Use only aircraft-grade epoxy; it's much easier to work with and it leads to better results.

Immediately following the resin/fiber mixture, I applied the layers of glass cloth that would form the mold. I try to minimize the amount of resin; the cloth reaches its maximum strength once it's completely soaked. Any excess resin only adds weight. The first layer of cloth can be laid on the mixture with almost no resin at all. I added subsequent layers of cloth until it formed a rigid mold. For small items like this, I stick to a wall thickness of %2 to % inch; this requires approximately five layers of 1 -ounce cloth. I always let the cloth cover a fairly wide area (about 1 inch) around the plug, as the second half will be formed against this and will require trimming after the moldings have cured. This photo shows the final stage of the first half of the mold.

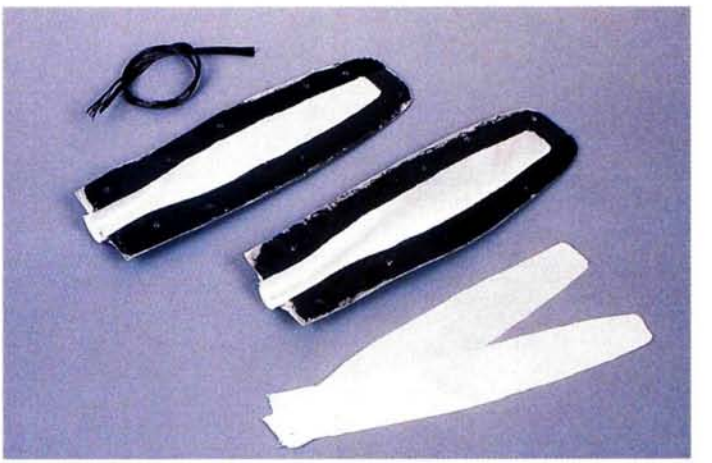
When the first half had fully hardened, began the second half of the molding. Never remove the molding from the support or the first half of the molding from the plug in the early stages; patience is the key to this process! I carefully removed the blade from the support and cleaned off any excess clay. This photo shows part of the newly formed flange in black, with all of the clay still stuck to the blade and flange. Thanks to the release agents, it was easy to remove.

Next, I used a Dremel saw to cut off any excess cloth. To ensure a proper fit, I drilled some 1/8-inch blind holes into the flange, spaced about 3 inches apart. This will act as a lock when forming the second half of the mold. Commercial pins are available as well, but for small items like these, I generally stick to this method. Once again, I liberally treated the plug and flange with release agents before moving on to the next step.

For the second side of the molding, I simply repeated all of the previous steps. Here, I've just applied the glass cloth to the molding compound to begin forming the second half of the mold.

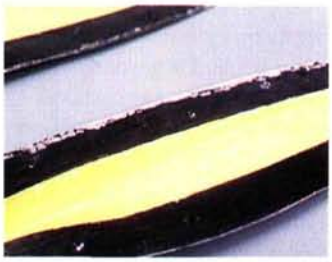
When they were fully cured, I drilled the moldings through while they were still attached to the plug; this ensures maximum accuracy. I then trimmed off the excess cloth and separated both halves from the plug. For the first splitting, I normally use some warm water to dissolve the PVA; an old credit card carefully placed in between the flanges can also be beneficial. Never use metal tools or brute force! Usually, the plug just falls off. In this photo, I had just removed the two halves from the plug.

Because you must close the mold while the cloth is still wet, it is essential that the cloth fit the molding exactly. Pictured here are two layers of 0.4-ounce cloth together with a non-woven surface cloth. The black shoelace is, in fact, carbon roving, which I later laid around the blade's perimeter.



Making the actual prop is basically just a variation of the molding process, beginning with the application of the wax and PVA; the primary distinction is in the outside coating. Though gelcoat is the most common choice, you can also use a good quality epoxy-based paint. I brushed on two coats of yellow Hobby Poxy. Once it had hardened to the point that it was sticky, I brushed in some slightly thickened resin.

14 This is a close-up of the molding halves with the slightly thickened resin brushed in. This layer is necessary to prevent the cloth from showing through the blade and is best left to harden for about 30 minutes to an hour before you apply the first layer of cloth.



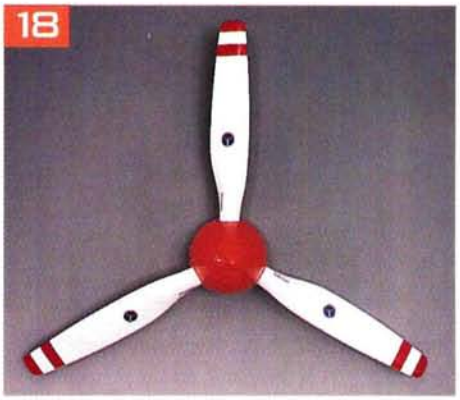
15

This photo was taken immediately before I joined the halves. In this stage, all of the material is wet. On one half, I filled the perimeter with a mixture of resin and fibers and strands, and I placed wet carbon roving on the other half. After joining the halves, I inserted a small brush through the root hole to press the roving to the inside of the leading edge and the root.

The P[r0]P came out of the mold shiny and glossy. After trimming off the excess resin, I had a perfect, strong and lightweight static prop blade. Production of subsequent blades is very straightforward and requires only a fraction of the time that's needed to make the first blade.

Of course, three blades alone do not form an air screw. This photo shows all of the parts required to form the completed item. I made the static spinner from carbon in the same mold that I used to make the flying spinner. I used some hard foam to make the backplate and the purple blocks that serve as blade retainers. I used a graphics computer program and printed my own decals using Super-Cal decal paper.

18



This is the completed static prop ready to go—my latest pride and joy. In *VA* scale, the prop's diameter came out to be 20 inches.

Hobby Poxy, *36 Pine St., Rockaway, NJ 07866; (973) 625-3 WO; fax (973) 625-8303.*

FMA Direct Co-Pilot

by Gerry Yarrish

One of the newest devices to aid us in flying our models is the Co-Pilot Infrared Stabilization System from FMA Direct. For this article, we really put the Co-Pilot through its paces by installing it and testing it in three different types of airplanes. We tested it in the Multiplex Brummi, a simple, 3-channel electric high-wing trainer, and also in Hangar 9's high-performance, low-wing glow-powered ARF, the Advance 40. Then, to completely change things, we installed it in the JR Ergo Sport, a fully aerobatic .60-size helicopter. The Co-Pilot handled each plane and its particular characteristics perfectly. If you've ever wanted to install a compact and reliable autopilot system in your RC model, read on. We're sure you'll be as impressed as we are.

SPECIFICATIONS

PRODUCT: Co-Pilot Stabilization System

MANUFACTURER: FMA Direct

INPUTS: aileron, elevator and auxiliary channel for remote on/off switching

OUTPUTS: pitch (elevator) and roll (aileron or rudder)

SYSTEM WEIGHT: 1 oz.

DIMENSIONS

SENSOR HEAD: 1.35 in. across (octagonal) x 0.53 in. thick

CONTROLLER UNIT: 1.5x0.89x0.6 in.

POWER CONSUMPTION: 5mA

PRICE: $119.95

COMMENTS: the Co-Pilot is an infrared-sensing, two-axis onboard stabilization system that plugs into your model's receiver system. The unit is very easy to set up and calibrate and can be used with fixed-wing airplanes, flying wings, and helicopters. The unit comes with a 24-inch ribbon wire to connect the sensor head to the microprocessor controller unit.

HITS

- Works exactly as advertised.
- Easy to install.
- Simple to calibrate and operate.

MISSES

- Only one sensitivity adjustment; it would be nice to be able to adjust pitch and roll independently.

3 tests
—helicopter, high-performance and trainer aircraft-works iike a champ!

The Co-Pilot is a two-axis, four-sensor control-stabilization system that plugs into your RC system. It has no moving parts and uses infrared (IR) heat sensors to control the model's roll and pitch. The system has two components: a sensor head that you attach to the underside of your model and a controller unit that you install inside your model like a receiver. A thin ribbon cable connects the two. Two wire leads are connected to the controller; one has a push-button switch, and the other ends with a servo-lead connector. You use the switch when you calibrate the unit before each flight session, and the servo lead can be plugged into an unused radio channel in your receiver for in-flight on/off function.

The Co-pilot comes with a well-illustrated instruction booklet that shows various installations. The instructions show in detail how to install the unit in a normal fixed-wing airplane, in a flying wing and in a helicopter. Here's how it works.

Above: the controller unit is smaller than a standard receiver and is plugged into the radio system between the servos and the receiver.

Right: the FMA Co-Pilot sensor head is held in place on the belly of the model with a piece of hook-and-loop fastener. Note the ribbon wire leading inside the model to the controller unit.

Below: with the model standing on its nose, simply press the calibration switch; the controller unit does the rest. Note that the sensor head on the model's belly is facing away from me during the procedure.

The sensor head has four IR heat sensors that face left, right, forward and aft. The sensors read how much IR heat is present in the four directions. The controller unit evaluates the IR heat information and adjusts the controls to keep the IR heat values equal for all four sensors for normal straight-and-level flight. Infrared heat is a much better source for control input than visible light because IR heat isn't affected as much by cloud cover.

The controller is plugged into the RC receiver system between the receiver and the servos. Once it has been calibrated, the unit need not be calibrated again unless the weather changes drastically. Since the unit works by reading the differences in IR heat levels rather than in light intensity, it works equally well in bright sunlight or overcast conditions. The unit will also work at night, though the inability to see your model is a limiting factor.

It takes only a few minutes to install the units; you'll need to cut a small opening in the bottom of the fuselage so you can pass the ribbon wire through to connect the sensor head to the controller. This takes only about 2 minutes.

CALIBRATING THE UNIT

Before the first flight of the day, you'll have to calibrate the unit to read the ambient IR heat; this is a two-step procedure. First, place the model's nose on the ground with its tail sticking straight up and the sensor head facing away from you. Turn on the transmitter and receiver and then press the push-button IR calibration switch. The control surfaces will then quickly deflect several times; the number of deflections tells you

High-performance applications *by Rick Bell*

I wanted to see how the FMA Co-Pitot performed in a model other than a trainer, so I installed it in a Hangar 9 Advance 40. On the day I flew it, the weather was partly cloudy with temperatures in the mid-50s, and the wind was about 7- to 13mph. I set up the unit to control the elevators and ailerons to allow me to turn it off during the flight if something went wrong. I connected the remote sensitivity lead to the retract gear switch.

Cautiously, I took off with the unit turned off. At a safe altitude, I turned it on, let go of the sticks and waited to see what would happen: the plane continued to fly straight and level. I could see the wind rock the wings, but the unit always returned them to level-pretty cool! With more confidence in the system, I turned the plane around for another pass and could feel the unit "fighting" my control inputs.

On the next pass, I rolled the plane into knife-edge flight and, again, let go of the sticks. As before, the plane returned to level flight—this was getting interesting! On the next pass, I rolled the plane inverted and let go of the sticks; the plane immediately corkscrewed back to upright and level flight. I did this several more times, and the plane always returned to upright and level flight without any input from me. Don't do this at low altitude! When the plane is inverted, the unit applies up-elevator, and the plane does a split-S back to straight and level. I think ft would be better if instead the unit rolled the plane upright without elevator input.

I was quite impressed during landing approaches; as the speed decreased, the plane settled nicely, and the nose and the wings remained level. I needed to use throttle only to make the approach to the runway and rudder to compensate for the crosswind; the Co-Piiot made landings really easy.

The Co-Pilot works as advertised. Whether you use it in a high-performance model or in a .40-size trainer, Co-Pilot removes much of the risk, and this, consequently greatly enhances the RC experience.

on a scale of from one to 10 what the IR conditions are. Between three and 10 deflections means the unit will operate properly; two indicates that the unit will operate but needs its sensitivity increased over cooler terrain. If the unit deflects only once, it means there isn't enough difference in the IR temperature between sky and ground. It's best not to fly with the unit turned on.

After step one, the servos begin to cycle slowly. During this time, you must place the model on the ground in a level flight attitude and then walk away about 10 feet. The unit then calibrates itself for level flight. Once the unit is calibrated, all you have to do before each successive flight for the rest of the day is to quickly check that the unit is working. Turn on the transmitter and receiver, and point the model's nose toward the ground. The unit should provide full up-elevator. Also, when you point a wingtip at the ground, it should deflect either the rudder or the ailerons (depending on which channel you have the unit plugged into) to correct the bank angle. After this quick check, you can launch the model.

AUTOPILOT FLIGHT

The day I tested the unit, I installed it in a Multiplex Brummi and flew it on a windy day. From the moment I hand-launched the model, the unit worked beautifully. As is normal, to climb, I held up-elevator and applied full power. When the model was about 75 feet high, I let go of the control stick and waited to see what would happen. The Brummi tracked straight into the wind, and its wings always returned to level—even after a strong gust of wind tipped the wing nearly vertical. After it flew to the edge of the field, I turned the model to the right (slightly downwind) and let go of the controls again. As before, the model righted itself whenever necessary and maintained a constant altitude. During the flight, I even crabbed the model into the wind; it happily flew slightly sideways as the wind pushed it along. The wind became rather strong at this point, so I throttled it back and guided the model straight into the wind for a landing. The Co-Pilot kept its wings level all the way to the flare; all I did was adjust the throttle to control the descent.

On the second flight, I turned the sensitivity down about 1/4 turn and had an even nicer flight. This time, the wind

The Co-Pilot EXPERIENCE

by Hal deBolt

This radical new Co-Pilot stabilization system reminds me of the first adventures I had with reed and proportional RC systems. You have to do two things to make the unit operate properly. First, be sure that the neutral points on the model's control surface are properly set before you install the unit. Then, after completing the Co-Pilot preflight checkout, you must make sure that the control settings haven't changed. With or without the Co-Pilot online, they should be the same.

The hook-and-loop-fastening material that came with the unit was a little too spongy for my taste. It could be compressed and then not return to its original condition. This lack of consistency made it easy to disturb the sensor, which caused an alignment problem. Using either a thinner fastener material or double-sided servo tape to attach the sensor would eliminate this problem. The ideal location for the sensor is out on a wing panel, away from things that can affect the sensor's view. It is possible to mount it on the fuselage, but you must make sure that the landing gear and/or the propeller do not affect the unit's operation. To properly control the model, you will have to fly the model with the unit activated to see if it needs any fine-tuning. I found that a solidly mounted sensor was difficult to adjust, so I made a simple, adjustable sensor mount with a ball-link attachment on the fuselage. It is a plywood plate attached to a ball swivel, which permits infinite movements. Two adjustment screws allow fine-position adjustment of the entire sensor unit. This adaptation worked just fine.

AUTOGYRO APPLICATION

Gyros and helicopters require constant control attention; a loss of orientation and control close to earth can be disastrous. It isn't unusual for a gyro to attain a nose-up attitude without the pilot noticing the change. I have seen gyros get to very high altitudes and then drift for a 1/2 mile downwind because the model's attitude wasn't apparent to its pilot. If this happens to someone who is using the Co-Pilot, the system will stabilize the model until orientation is regained. The Co-Pilot works so well that I have also seen it control a perfect landing for a gyro that was practically out of sight. The gyro was hovered at a high altitude and when the model's power was reduced, it produced a proper descent that ended in a no-rollout landing.

On all types of models-fixed-wing, helicopters and autogyros-I can say that the FMA Co-Pilot stabilization system works as advertised!

HELICOPTER CONTROL

by Rick Bell

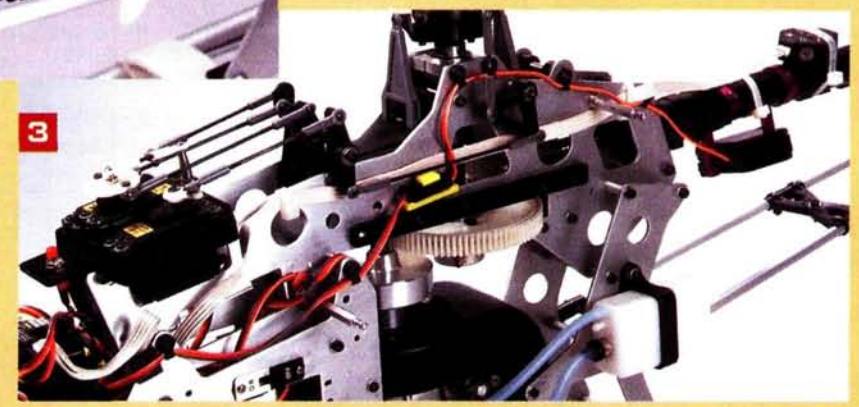
How's this for stability? No-hands hovering!

I was anxious to test the FMA Co-Pilot in a helicopter, so I used my JR Ergo Sport 60. The unit's manual recommends that a hole be drilled into the chassis for the calibration button, but instead, I mounted the button on the front of the servo tray and secured the control box on the top of the gyro. I attached the sensor unit to the top of the tail boom and oriented its pickups at a 45-degree angle to the heli's centerline. I then routed the ribbon cable forward to the control box and secured it so that it wouldn't become entangled with the pushrods, bellcranks and other airframe parts. The installation took only a few minutes.

Following the instructions, I plugged the unit into the receiver and then connected the roll and elevator servos to the unit. There are four dipswitches on the control box, and these must be set in the correct sequence for the unit to give the correct control inputs.

Calibrating the unit took some effort; I couldn't get it to function properly the first time I tried to calibrate it. When I tilted the heli to the right, the Co-Pilot gave a right roll command, and that was the wrong direction. And when I switched the unit on or off with the auxiliary channel, the trim settings changed considerably.

It was easy to fix the trim changes; during calibration, I tilted the heli to compensate for the changes. The control input problem was also easily solved by adjusting the positions of the dipswitches. Once I figured out the sequence, the Co-pilot worked correctly and made the appropriate inputs.



1: mounting the sensor on a helicopter is a little different from mounting it on an airplane; the sensor must be rotated 45 degrees, and it must be set horizontally. I used double-stick tape and a zip-tie to secure the sensor to the tall boom. Instead of the recommended hook-and-loop-fastener. 2:1 mounted the control unit onto the top of the gyro and attached the calibration button to the front of the servo tray. These proved to be good locations for both items. 3: neatness counts! All wires are neatly tucked out of the way so they don't interfere with any part of the airframe, and I used zip-ties to secure the ribbon cable to the chassis. Installing the Co-Pilot in a helicopter takes only a few minutes.

TEST FLIGHT

After I calibrated the unit, I set the sensitivity at about 50 percent and started the helicopter. I switched off the Co-Pilot and trimmed the heli for a hands-off hover. For safety, I climbed to about 25 feet and then hit the switch to turn on the Co-Pilot. The heli continued to hover and didn't move at all. To confirm that the unit was working, I gave a right roll command and released the stick; the heli promptly returned to a stable hover. With more confidence, I then gave a forward cyclic command, but much more aggressively. The result was the same-the heli immediately returned to a level hover. Very neat indeed!

The heli was also very stable in forward flight. I could feel the Co-Pilot attempt to counter my control inputs; this was unnerving at first, but I soon became accustomed to it. The neat part about forward flight was that when I let go of the sticks, the heli quickly stopped and returned to a hover.

The FMA Co-Pilot is a great tool to help beginners learn how to hover and get into forward flight with little risk to the heli. The possibilities are almost endless. Learning tail-in or nose-in hovering, performing aerobatics or stabilizing a helicopter camera platform are all easy when the helicopter returns to a stable upright hover simply by letting go of the sticks! Give the Co-Pilot a try; you'll be pleasantly surprised.

condition was much calmer, and the sun was out. I recalibrated the unit and launched the model as before. On the first day, the IR rating was three; on the second day, it was five. Again, the model flew beautifully with very little input from me. What a cool experience!

I am completely happy with the Co-Pilot's performance. If you fly your model in normal (mildly windy) conditions, it will easily fly all by itself. Used in conjunction with an instructor, this unit will greatly shorten the learning curve for any beginning pilot. For $119.95, the Co-Pilot is a great learning aid for the student pilot. As he becomes more accustomed to the model's stability, the unit's sensitivity can be gradually decreased until the student can fly completely unassisted. For experienced pilots, the unit can be used to enhance the stability of faster models, especially in gusty conditions. It helps smooth out final approaches, and that improves landings. Install the FMA Co-Pilot in your next model and give autopilot flight a try. You'll love it! ±

JR; distributed by Horizon Hobby Inc.

FMA Direct, *9607 Dr. Perry Rd., Unit 109, Ijumsville, MD 21754; (800) 343-2934; fax (301) 831-8987; www.fnuidirect.com.*

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HOW TO

Assemble ABS Cowls and Wheel Pants

Basic skills, advanced results

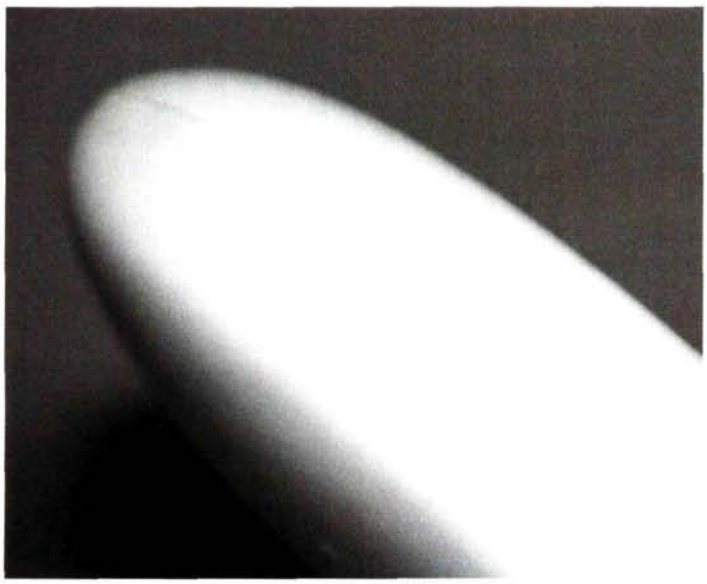
by nek Ben

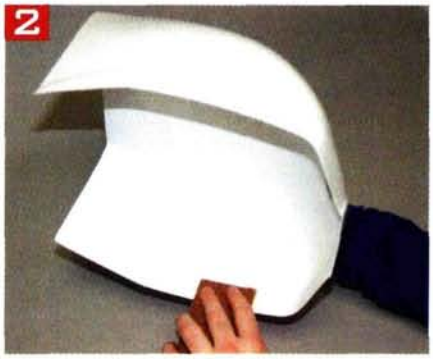
When you buy the latest and greatest kit, chances are pretty good that the included vacuum-formed ABS plastic cowl and wheel pants will need to be assembled. Because of the assembly required, many modelers don't give these ABS plastic parts a second thought; instead, they toss them into the spare-parts box and opt to use aftermarket fiberglass replacements.

The truth is, the ABS parts in kits are usually of good quality and don't require a lot of work to produce strong, durable, lightweight cowls and wheel pants. The techniques and tips presented describe how I assemble ABS parts for a one-piece look.

To produce a good result, you'll need some basic materials such as fiberglass cloth, glue for plastic (or thin CA), putty, styrene plastic and spray contact cement. These are used to assemble and strengthen the parts and improve their looks. For this article, I used a cowl and wheel pant from Midwest's giant-scale CAP 232. Let's take a look.

D First, trim the parts for proper fit. This step determines how much extra work you'll need to do later. The more thorough you are now, the less filling and sanding you'll need to do later. Be methodical with this step. The cowl and wheel pant parts should fit together easily and not have to be force-fit.

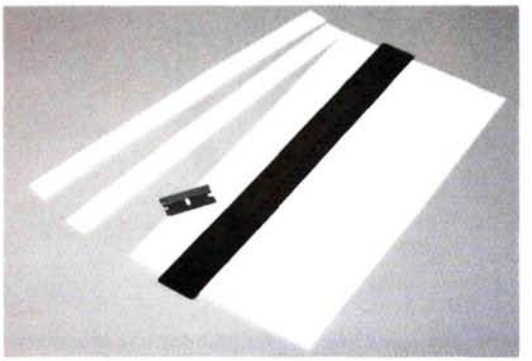




When the parts have been trimmed but before you glue them together, scuff the inside of the cowl and wheel pants with 60-grit sandpaper. This will give the epoxy (applied later) something to grip.

Most cowl and wheel-pant halves have molded-in lips that mate with each other; this provides a gluing surface for the parts. (If your parts have molded-in lips, skip to step 6.) Some parts, however, are trimmed at the factory and do not have a lip for the mating half. Don't despair; you can easily add a lip using strips of styrene. Many hobby shops have sheets of styrene plastic for scratch builders; I use sheets that are 0.030 thick. This provides plenty of strength yet is flexible enough to be molded to the shape needed. For cowls, I cut %-inch-wide strips; for wheel pants, I use 1/2-inch-wide strips.

Using small spring clamps, test-fit the plastic strips to the inside of the cowl and note where you'll need to bend the plastic to conform to any curves. Do the same for the wheel pants. Using your fingers, gently bend the plastic to the curve needed; you'll be relieving the tension in the plastic strips when they are glued into place.



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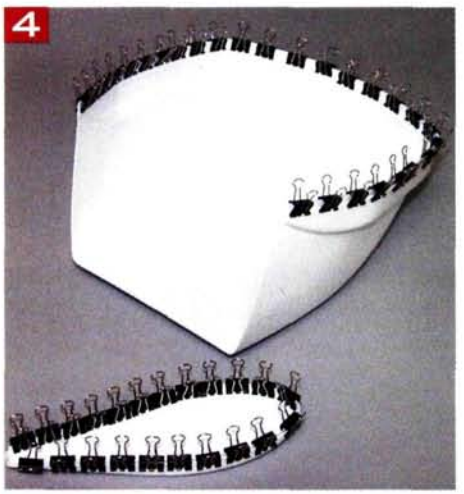
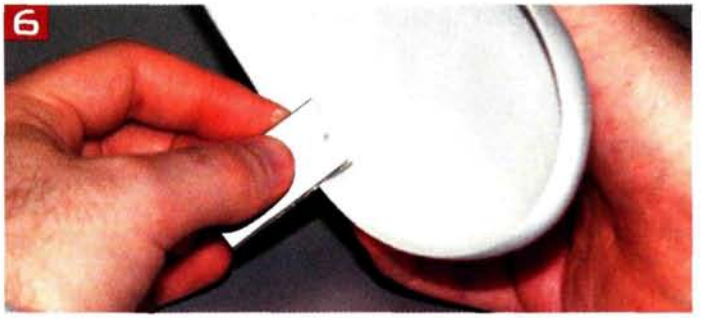


Now glue the strips into one of the cowl halves and a wheel pant, and use plenty of spring clamps. For glue, I usually use Oatey Clear PVC Cement (you can also use thin CA); it slightly dissolves the plastic and when the cement dries, the parts will be firmly welded together. Let the cement cure overnight.

After the glue has set, remove the clamps and check the lip for any glue residue that needs to be removed, and then test-fit the parts together. Because of the wheel pant's curves, you'll most likely need to trim the lip so the halves can easily fit together. Remember, take your time so you achieve the best possible fit. The cowl should not require much trimming. When you've finished, the parts should again fit together easily.

6



Here's a tip: before you glue the halves together, take a razor blade or a hobby knife with a no. 11 blade and put a slight radius on the inside corner of the mating part. By removing this edge, you allow the parts to fit together more tightly. You'll end up with a more closely fitting seam that requires less filler.

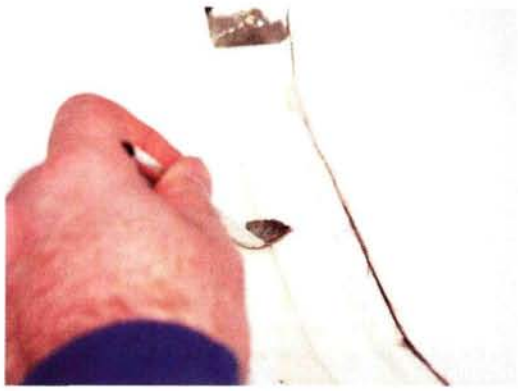
7

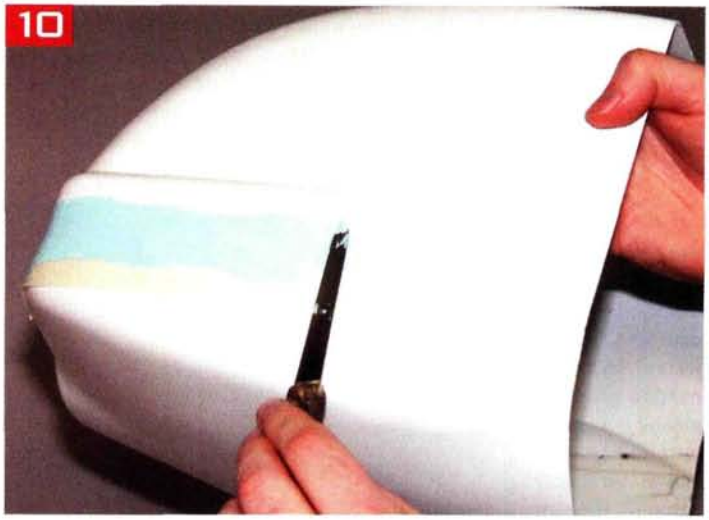
Now glue the cowl and wheel-pant halves together. I again use Oatey PVC Cement and plenty of tape, rubber bands, or clamps to hold the parts together. Here are the cowl and wheel pant glued together and ready for reinforcement and seam work.

8

Use 60-grit sandpaper to block-sand and remove any high spots, and then blend the seams together. As you sand, you'll notice some shiny spots; these are low spots that you'll need to fill with putty. Don't worry about any scratches; they'll be filled in with putty and primer later. Now block-sand and further smooth the seams with 150-grit sandpaper to remove most of the scratches. It's a good idea to wear a mask when you're sanding so you don't inhale the dust. Now is a good time to cut out the openings in the cowl and wheel pant (you'll need access to the inside of the pant for the next step). Use a rotary tool with a cutting bit to rough out the openings, and then use a file or sandpaper to final-shape the openings.

9 Cut some strips of heavy (4- to 9-ounce) fiberglass cloth about 2 inches wide for the cowl and about 1 1/2 inches wide for the wheel pant; you'll use them to reinforce the seams from the inside. If the plastic is somewhat thin, you can fiberglass the entire inside instead of just the seam. Also have some smaller pieces of cloth handy for oddly contoured areas and to add reinforcement to mounting holes or other weak areas. Now lay the strips of cloth into place over the seams. To simplify this job, spray a light coat of contact cement on the cloth; this will help hold it in place when you brush on the epoxy. Mix about 1/2 ounce of slow-curing epoxy in a graduated cup (smaller batches have a longer working time). Thin the epoxy a little by adding some rubbing alcohol to it; a thinner mixture more easily soaks through the cloth and onto the plastic. To apply the epoxy, use disposable acid brushes; they are easily bent to reach into nooks and crannies. Apply enough epoxy to the cloth to thoroughly wet it but not so much that it runs all over the place, and then check for voids; apply more epoxy as necessary. Work small areas at a time, and then move to a different section. Allow the epoxy to cure for several hours.





10 After the epoxy has cured, trim away any excess cloth. Now the parts are ready for you to remove the seams and apply the putty. Many putties are available; most modelers have their favorites. I like to use 3M Acryl-Blue Glazing Putty, available at auto-parts stores. This putty dries quickly, doesn't shrink and feather-sands nicely. You can also make a filler paste of epoxy and baby powder. Use an artist's spatula to apply the putty to the part and smooth it out. Work the putty into the seam and the surrounding area. I applied tape to one half of the cowl so I wouldn't put any putty where it isn't needed. Once the putty starts to set up, remove the tape. Be sure to work in a well-ventilated area!

11 After the putty has cured, roughly block-sand the filler to shape with 60-grit sandpaper. Check to see whether any additional filler is needed, and apply as necessary. Now switch to 150-grit and start to smooth out and feather the filler into the surrounding areas. Constantly check the filler for low spots and fill them if necessary. Because you're using a sanding block, the putty on the high spots are sanded out while the putty in the low areas gets left behind. Next, lightly wet-sand the entire part with 400-grit wet or dry sandpaper to help remove scratches left behind by the previous sanding. Just be careful not to sand away the putty. Thoroughly wash the parts to clean off any finger oils and dust in preparation for priming. Because I covered my model with Top Flite MonoKote, I used LustreKote primer. Whichever paint system you use, check its compatibility on some scrap plastic first.

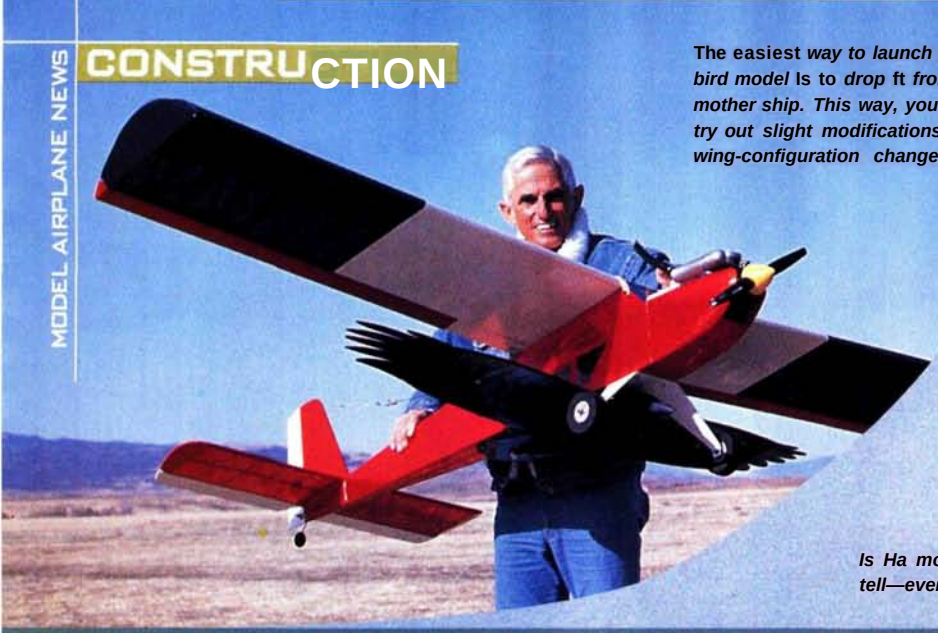
Now that you have primed your parts, they should look just like primed fiberglass parts. With a little effort, time and basic building skills, you will have made a cowl and wheel pants that are as durable as fiberglass, and you will have saved yourself some money in the process. So when your next kit includes ABS plastic parts, don't chuck them out; build them and amaze your flying buddies with your finishing skills. ±

LustreKote; distributed by Great Planes Model Distributors Co., P.O. Box 9021, Champaign, IL 61826-9021; (800) 637-7660; fax (217) 398-0008; www.greatplanes.com.

***MonoKote;** distributed by Great Planes.*

***Top Flite;** distributed by Great Planes.*

CONSTRUCTION



The easiest way to launch your bird model is to drop it from a mother ship. This way, you can try out slight modifications and wing-configuration changes.

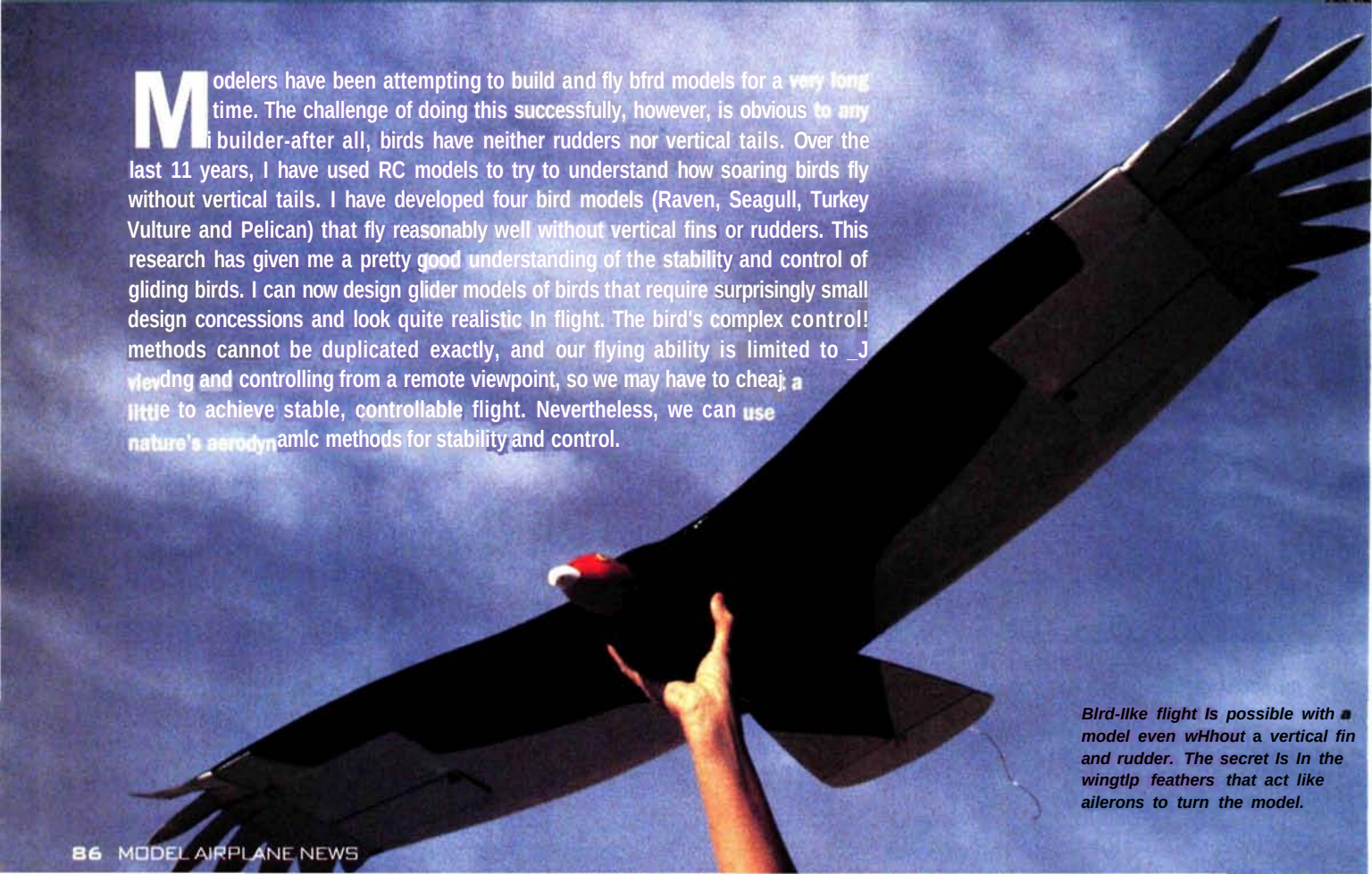
Is it a model or the real thing? Really hard to tell—even for real birds!

Design and Build an RC Bird Model

A turkey vulture that can thermal!

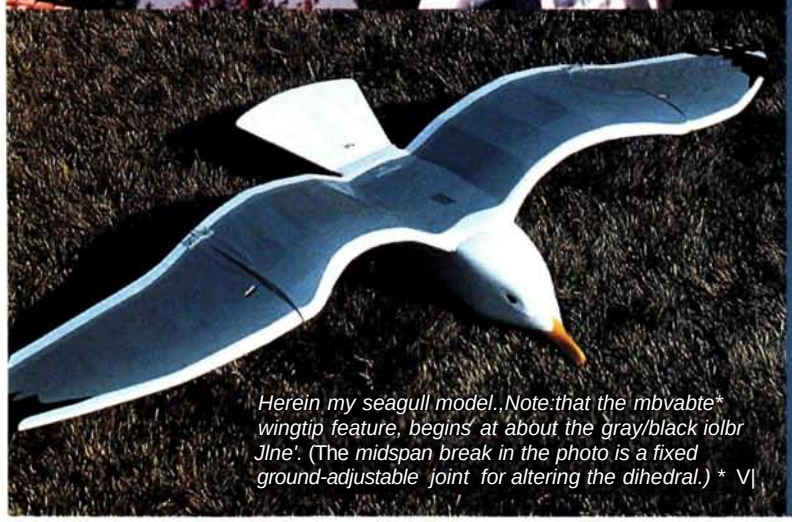
by Bob Hoey

Modelers have been attempting to build and fly bird models for a very long time. The challenge of doing this successfully, however, is obvious to any builder-after all, birds have neither rudders nor vertical tails. Over the last 11 years, I have used RC models to try to understand how soaring birds fly without vertical tails. I have developed four bird models (Raven, Seagull, Turkey Vulture and Pelican) that fly reasonably well without vertical fins or rudders. This research has given me a pretty good understanding of the stability and control of gliding birds. I can now design glider models of birds that require surprisingly small design concessions and look quite realistic in flight. The bird's complex control methods cannot be duplicated exactly, and our flying ability is limited to viewing and controlling from a remote viewpoint, so we may have to cheat a little to achieve stable, controllable flight. Nevertheless, we can use nature's aerodynamic methods for stability and control.



Bird-like flight is possible with a model even without a vertical fin and rudder. The secret is in the wingtip feathers that act like ailerons to turn the model.

Even a** big old pelican can be **modeled.** Notice its graceful **wlngtlp aileron feathers.



Herein my seagull model..Note:that the mbvabte wingtip feature, begins at about the gray/black iolbr Jlne'.* (The *midspan break in the photo is a fixed ground-adjustable joint for altering the dihedral.)* * V|

SPECIFICATIONS

MODEL: Turkey Vulture

MODEL TYPE: bird-like rudderless glider

WINGSPAN: 64 in.

WING AREA: **600** sq. in.

LENGTH: **25.5** in.

WEIGHT: 2.5 Ib.

WING LOADING: 9.75 oz./sq. ft.

RADIO REQ'D: 2-channel (aileron and elevator)

COMMENTS: designed by Bob Hoey, this bird-like RC Turkey Vulture uses highly effective wingtip aileron feathers to bank and turn the model just like a real bird. The model has no vertical fin or rudder but is very stable in flight. Built of balsa and plywood, the model is covered with MonoKote and has a drop-away ventral fin for bungee high-start launches. It can also Ib dropped from another airplane. The wing is highly under- mbered and slightly reflexed. The plan shows the articulated Bngtip aileron feathers in detail.

DESIGN METHOD

Start by observing and photographing the bird species you wish to imitate. Try to get bottom, side and front views, but be prepared for a real challenge, since these critters are continuously changing shape. Slides are best because they can be projected onto a wall, and your subject's shape can be traced with a pencil. Varying the projection distance also allows different views to be scaled to the same size. Use a little artistic license and develop a 3-view.

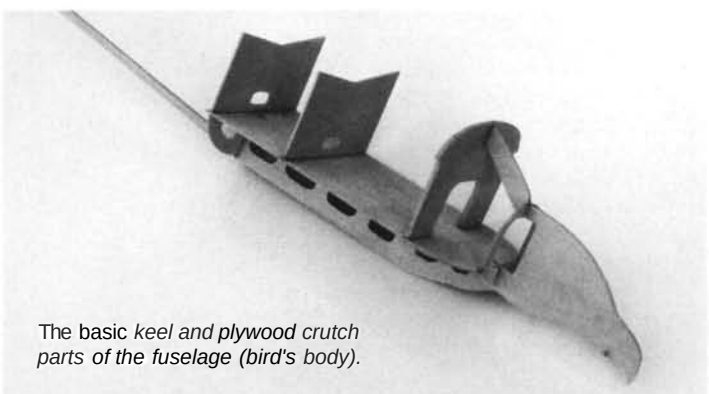
Next, apply the simplified stability and control criteria described herein (center of gravity [CG] location, wing dihedral and sweep). Make design alterations to your 3-view to bring these numbers within reason. The final step is to design flexibility into the structure to allow for trial-and-error development of your design. (Provide for changes in dihedral, CG and tail area, for example). Gliding flight without a vertical tail is certainly possible, but stability will be less than that of a typical RC glider.

PITCH AXIS

The complex planform of a bird's wing requires more attention during the design to properly locate the CG. The wing's mean aerodynamic chord (MAC) and aerodynamic center (AC) can be located using the procedure described in the "Click Trip" URL at the end of this article. First flights should be made with the CG close to the aerodynamic center. Bird models are typically very short-coupled in pitch, and the tail area may need to be enlarged, much like any scale model. A 15- to 20-percent increase will improve trim ability and require less attention to maintain glide speed. Using a slightly reflexed airfoil (typical for flying wings) also avoids large tail deflections.

ROLL-YAW AXIS

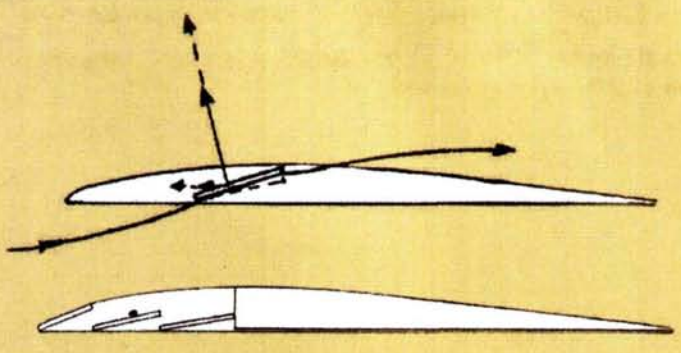
The complex shape of a bird's wing, and a bird's lack of a vertical tail, make the design of the wing critical to successful flight. Wing sweep and dihedral are the critical features. Dihedral varies over the span of most bird wings. Land birds (hawks, buzzards, eagles, etc.) usually have small dihedral near the root and increasing dihedral near the tip. Sea birds (gulls, pelicans, albatross, etc.), on the other hand, often have negative dihedral but high sweep in their outer wing panels. A method for defining the total dihedral effect for the wing is also described in the "Click Trip." These calculations are for the wing only and do not account for the



The basic *keel and plywood crutch parts of the fuselage (bird's body).*

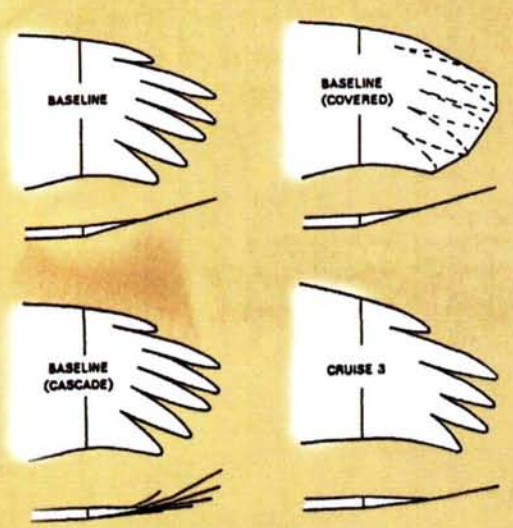
TIP FEATHERS: WHY THEY WORK

The tip feathers operate in a region of up-flow as the vortex begins to form around the wingtip. They have a large negative angle relative to the wing but are generating upward lift and a small amount of forward thrust. When used differentially as ailerons, the difference in lift produces a roll, and the difference in thrust causes a small yaw in the same direction. (These birds are pretty clever!)

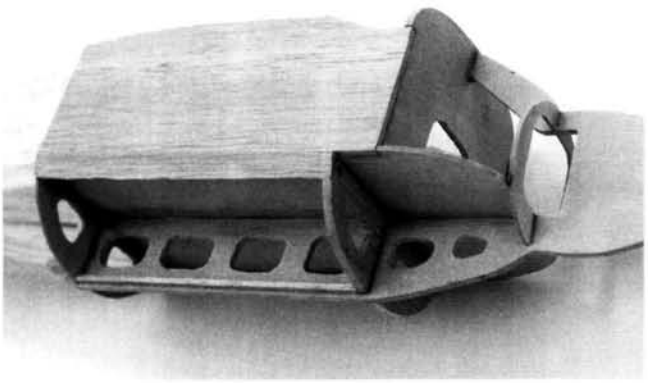


Initial setting: no roll, slight adverse yaw

Final setting: good roll, slight proverse yaw



TIP FEATHER CONFIGURATIONS



Here, the formers and side sheeting have been added to the structure.

destabilizing influence of the body, heads, beaks and other lateral areas forward of the CG. Artificial vertical fins in the form of "feet" (ventral fins) or clear circular discs near the wingtip, toed-in about 20 degrees, can be beneficial for early flights. The required fin area is usually quite small (6 to 8 square inches) and can be reduced or removed as flight experience increases. Note: electric motors at the front have been tried and are quite destabilizing. If you intend to try a propeller, use one of the above techniques to add some vertical fin area.

STRUCTURE

The outer wing panels of a real bird are extremely light compared with the rest of the structure (they're just feathers!). Outer wing panels should be kept as light as possible to keep roll inertia low. Heavy wingtips result in unwanted rolling oscillations. Unusual wing dihedral patterns (gull, for example) can be duplicated by using a full-depth balsa spar and cutting it to the desired dihedral shape. For thin wings, glue carbon fiber to the top and bottom of the spar for added strength. Sheeting the leading edges (top and bottom, back to the spar) will provide the necessary D-tube section for torsion strength. The model's weight will likely be considerably less than that of a real bird, especially for larger species, but this difference is mainly in the fuselage (body weight and shoulder muscles).

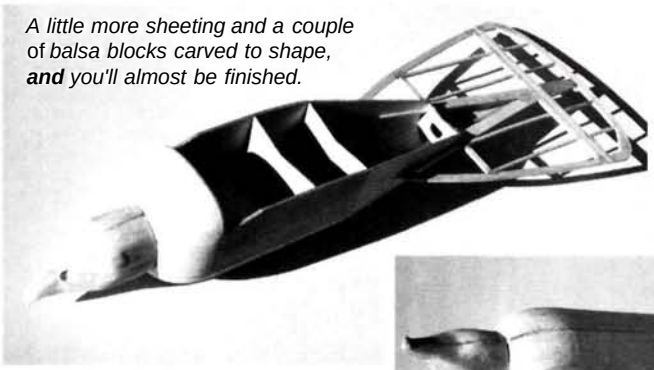
FLIGHT PERFORMANCE

FLIGHT CHARACTERISTICS

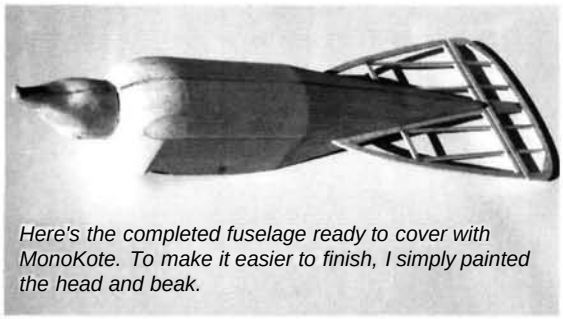
Set the elevator's neutral position so the elevator is parallel with the stabilizer. If you are using a computer radio, program the throttle lever to control (bias) the two ailerons up or down together (like flaperons). Set the tip-aileron neutral position so that the leading edge of each aileron is about 1/8 inch below the wing's leading edge. Add ballast as necessary to get the CG to the location shown on the plan. Do some hand glides in still air to establish the trim settings.

For slope advocates, this model is a real floater, as is its real-life counterpart. Without ballast, it does not penetrate well but is quite realistic in a fight breeze. If you have a computer radio, you can experiment with the aileron bias setting in flight. There should be a position that allows gentle coordinated turns with the tip ailerons with no adverse yaw. If you don't have a computer radio, try adjusting the aileron bias on successive flights to find the best setting. (Don't go too far upward, or aileron control will disappear completely.) The model will be considerably lighter than the real bird, so experimenting with ballast is appropriate.

Your Turkey Vulture model will not only attract attention from your fellow modelers, but it will also likely attract some attention from other soaring birds, such as hawks **and** ravens.



*A little more sheeting and a couple of balsa blocks carved to shape, **and** you'll almost be finished.*



Here's the completed fuselage ready to cover with MonoKote. To make it easier to finish, I simply painted the head and beak.

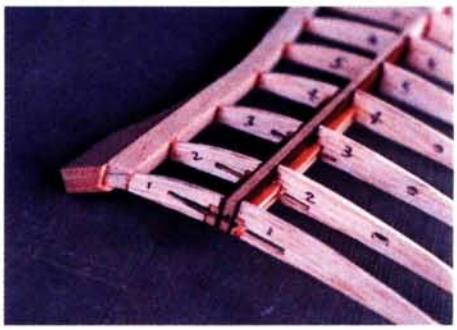
CONTROL

Two methods for pitch control have been tried—a standard elevator at the rear of the tail and the single-piece tail hinged at the wing's trailing edge. The elevator at the rear is the most effective.

Because of the large adverse yaw associated with ailerons, they don't work well when there is no vertical tail. A rolling tail (horizontal tail that tilts around a longitudinal axis for controlling turns) works OK depending on the CG location but is not very powerful. If used with a pitch-stable airplane (forward CG), the model flies well, but the control action is opposite to the way birds really fly (the model will turn in the same direction as the tilted tail, but no one will notice!). Drag flaps on the lower wing surface (or spoilers on the upper surface) also work well for initiating turns, but they aren't very efficient or realistic. Since they rely on dihedral effect to control turns, they often require larger wing dihedral than that observed on a real bird.

Wingtip ailerons (feathers) are the most bird-like roll-control method. They are very sensitive to the initial incidence setting of the two ailerons. I use a bias control through the throttle channel to help locate the proper angle in flight. For land birds, use the forward three feathers as a single aileron surface that rotates around a spanwise axis (detailed on the plan). For sea birds, use the outer 22 percent of the semi-span as an aileron, rotating around a

I used a 0.063-inch-thick piece of aluminum for my wing dihedral brace. Note that the full-depth spars slide into place in the slots cut into the brace.



The wing is built with a front and rear portion glued to the main spar. Here you see the wing root and the slots in the ribs for the aluminum brace.

CLOSE ENCOUNTERS OF THE BIRD KIND

During the past 11 years, many encounters have occurred between these models and real birds. Unfortunately, these encounters are usually spontaneous and take place at a fairly high altitude, so I have no photographic evidence of them.

There are lots of ravens around here; they are gregarious birds, and quite inquisitive. The models circle easily and climb with the real birds in thermals. Often, one or two ravens fly formation with the model and follow it as it circles in a thermal (or, just as often, I follow them). Occasionally, one will come in quite close. Because the wing loadings of the models are lighter than their real counterparts, the models can fly more slowly. Sometimes, I slow the model to near-stall and then watch as the poor birds stall or flap off to one side.

One warm, still day, I thermalled a Raven model with about 25 real ravens for about half an hour. The entire gaggle got so high that I had trouble distinguishing the model from the real birds. I made step inputs in roll control, and then flew the bird that rolled abruptly. From my notes on the day of the **flight: "Finally** I got too high to see well, so I put in full forward trim and flew straight. One bird followed, matching the model's speed and descent rate, and joined up in formation. I pulled up into a loop. He watched, then joined up again. I went into a full-up, full-left spiral for about 5 turns to lose altitude, then recovered. The raven pulled his wings in and did about 3 half-rolls, then some other maneuvers, then joined up again. I continued trying to descend, and eventually he left.

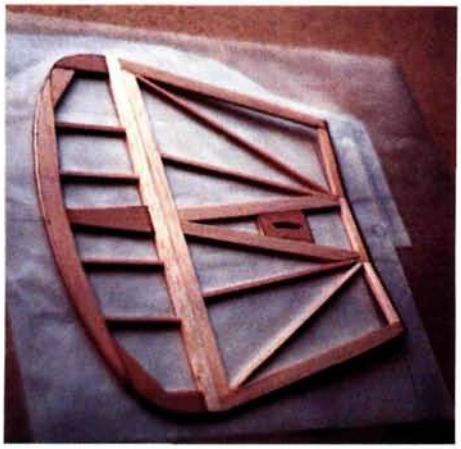
"The fixed-geometry, under-cambered wing of the models is no match for the refined, variable-geometry wing of the real birds in straight, high-speed flight. The model quickly drops below and behind. On several occasions, ravens have followed the model down to about 20 feet altitude, and then circled overhead squawking loudly as the model lands. One raven landed nearby and walked all the way around the model (it was probably puzzled by my belly landing)."

I have also thermalled the Turkey Vulture model with real turkey vultures. The appearance and climb performance were similar, but real vultures aren't as friendly as ravens; they completely ignored the model.

I've had the most fun with hawks. They will dive at any of the models (raven, seagull, or turkey vu usually go screaming by with their wings folded. I once watched a hawk regain altitude after the attack and then begin circling off to the side. He stayed there until I did something abnormal, such as a stall, with the model. He then folded his wings and came right at the model, aborting at the last minute. I triggered three attacks this way. Apparently, the hawks thought they were watching a wounded or sick bird. Recently, a hawk zoomed in and established a position directly above the seagull model just a few inches away. He stayed in that position for about 15 seconds as I made turns with the model. Eventually, he flew away. I expected to find claw marks on the model but saw no evidence of any conta and directly behind. They fly in trail with the model for awhile until they are satisfied that it is not a wounded, easy target. I hope to eventually install one of the new, tiny video cameras in a model to document some of these encounters-up close and personal.

Hawk attacks on the Turkey Vulture model are more cautious—usually from ab

Here, the two wing panels have been joined. Note the reflex shape of the airfoil. The wingtip aileron feathers and the leading-edge sheeting still have to be installed.



The tail feathers are built flat on the building board. Note that the horizontal stabilizer's leading edge is shaped to match up to the wing's trailing edge and is reinforced with He-inch plywood.

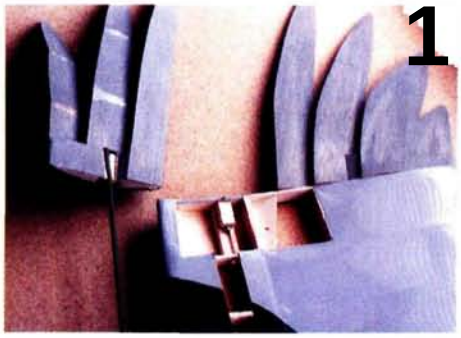
Here are the wingtip feathers. They are made out of He-inch medium balsa. Note the dihedral added to the first two pairs.

spanwise axis at the wing 1/4 chord (see the seagull photo).

Kimbrough rotary-drive couplers eliminate unsightly pushrods and control horns and minimize control-system slop. To provide the stiffest possible link, I use a carbon rod or an aluminum tube for the torque rod, and I mount the servos as far inboard in the wing as is practical.

BIRD-LIKE FLIGHT

In general, high-start bungee launches don't work well for models without rudders or vertical tails. I use a drop-away fin secured in a slot in the fuselage. The fin can be attached to the towline so that it drops off after launch. Slope soaring is easy and can produce very realistic flights in light wind. Air launches (drops) from a powered RC mother ship also work well (I have made more than 1,000 air launches to date). This launch method allows for repeat testing and refinement of the model. If a tip-aileron-bias feature (tip feathers) is being used, start with the aileron leading edge about 1/8 inch below the wing's leading edge at the end rib. Move the bias up slowly in flight until you find that sweet spot where gentle, coordinated turns are possible. A few words of caution: tip feathers are easily damaged. Building stronger feathers (out of fiberglass, for example) only adds more



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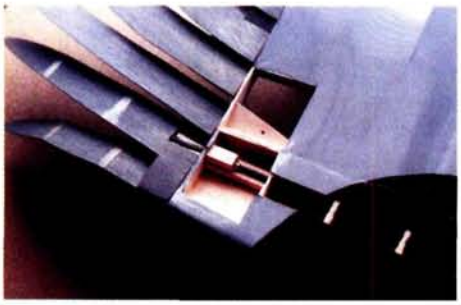
The *front three feathers are movable, while the rear three feathers are fixed in place on the wingtip. You can see the carbon-fiber rod and the brass tube bushing used to articulate the aileron feathers.*

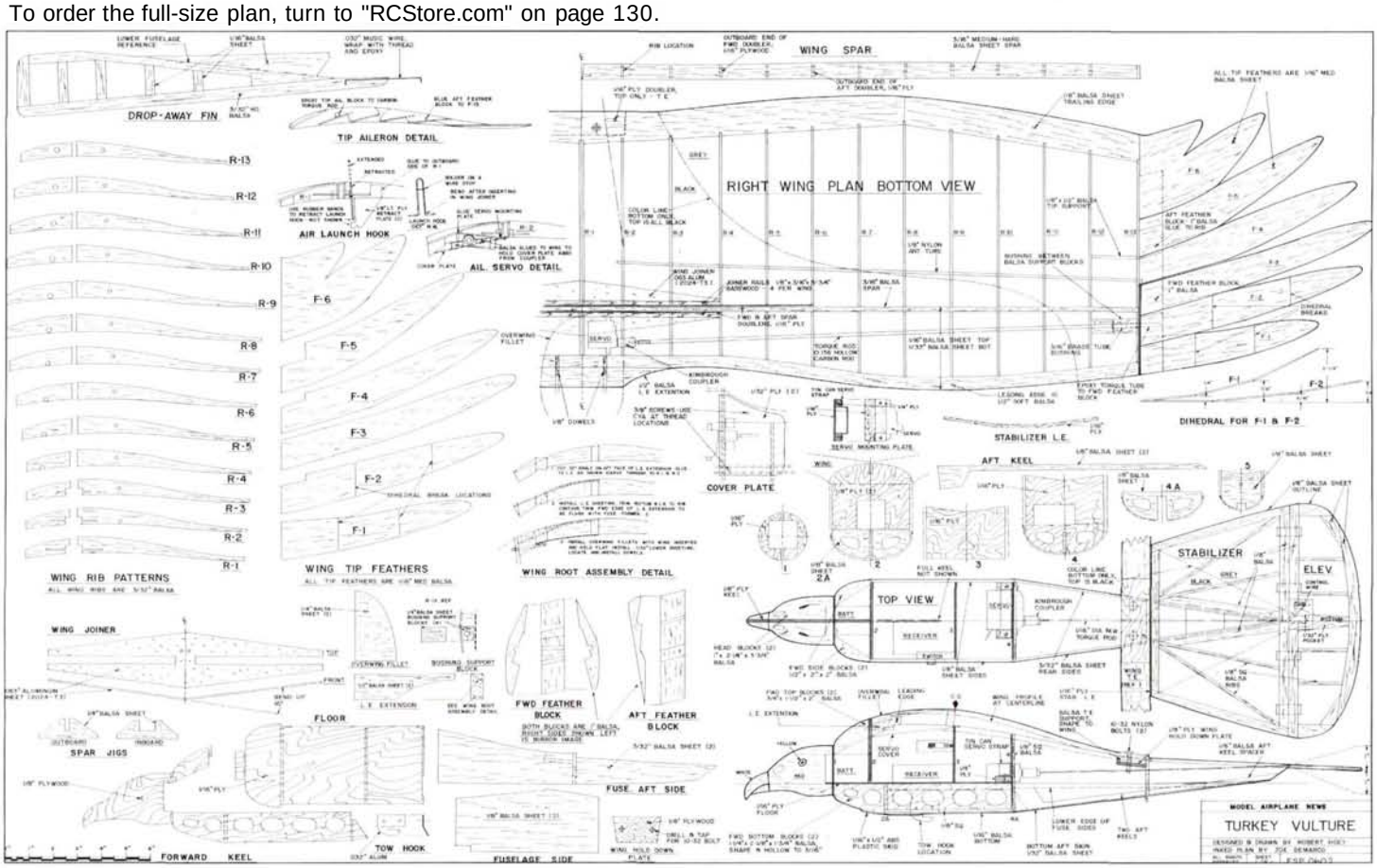


Here, all the wingtip feathers are in place. A hatch will be added to the opening under the tip.

weight outboard and moves the failure points into the primary structure. Wire tip-skids help some, but my solution is to use straight-grained 1/16-inch balsa sheet for the feathers and take some thin CA to the flying site.

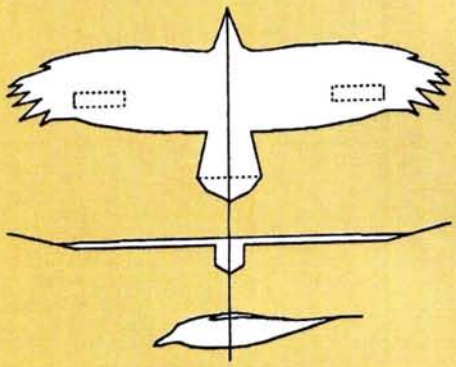
Let's hope these brief comments and

To order the full-size plan, turn to "RCStore.com" on page 130.



FLYING LIKE A BIRD

It was a calm Saturday morning, and as I walked outside for the morning paper, I spotted a raven gliding toward me at telephone-pole height. Although this is a common sight here in the California desert, I stopped to watch. I had just retired from the Air Force Flight Test Center as a stability and control flight-test engineer, and now I had time to expand my interest in bird flight as a new hobby. As I watched, the raven started a slow bank to the right with its wings fully outstretched. The turn got steeper and steeper until, at last, the raven dived-head-first—into the middle of the road, about 30 yards in front of me. I was dumbfounded. I had never seen a bird crash before!



Span • 4.17 ft. Length • 1.92 ft.
Wing area = 2.78 sq. ft. Aspect ratio = 6.2S
Weight = 1.1 lb.

BASE-LINE RAVEN

There was no evidence of life after the impact, and I suspected that the bird had suffered a stroke or a heart attack. In any case, this little fellow had unwittingly given his life to science. I seized the opportunity to weigh him and draw an outline of his wings and tail on a sheet of butcher paper. The dimensions were surprisingly similar to a ^A-size radio-controlled model that I had been flying. I reasoned that I could probably learn something about how birds fly by building a glider model with the same shape, size and planform of a large soaring bird.

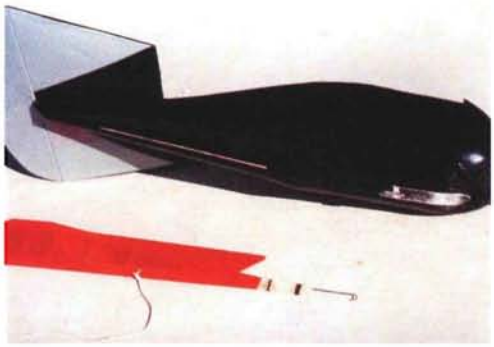
I hoped to establish a "base-line" configuration that would fly, even if I had to cheat a little at the beginning. The starting point was a series of small, balsa-wood, profile models with 6- to 8-inch spans that I glided around the living room. I was a little surprised to find that these models were stable in all axes, even without vertical tails. Lateral control was an enigma, but I soon discovered that either spoilers or drag flaps caused the model to turn toward the high-drag wing.

To provide room for the radio gear, I built the prototype Raven model about 8 percent larger than a real raven. Pitch control was provided by deflection of the rear portion of the tail, and lateral-directional control was provided by the use of drag flaps (downward only) on the bottom of each wing. I built it to be sturdy, since I expected frequent crashes. The model was launched from the top of a small hill. It appeared to be stable but glided with a gentle rolling oscillation that could not be controlled with the drag flaps, so a very small vertical fin was added. Stable and controllable glides were then possible.

It seems that each successful test produces additional, unanswered questions, such as: how do birds twist their wingtip feathers to produce proverse yaw? Does a bird's airfoil really have a reflexed trailing edge in flight? Do birds adjust the wing sweep at the wingtips as part of the control mechanism? Of course, there is also a wide variety of species with various wing shapes to try. I have only begun to explore the technical aspects of how birds really fly. I am constantly amazed at the incredible complexity of bird flight, and I marvel at that little "bird-brain" that's able to coordinate all the required actions.

For the full story, take the "Click Trip"!

The aileron servo for each wing panel is attached to the root end of the wing. This keeps the tips light for better turning performance. A Kimbrough rotary coupler connects the torque rod to the servo.



Left: without a vertical fin and rudder, bird models can be very difficult to launch with a bungee high-start or a winch line. To improve the ride, you can use a drop-away ventral fin like this one that fits into a slot in the bottom of the fuselage.

hints spur some interest in building models that look and fly like birds. The analysis methods mentioned are good starting points, but they do not ensure that a new bird model will fly well on the first launch. There is still much to learn about how birds fly.

BUILDING A TURKEY VULTURE

Early flights of my Turkey Vulture model oscillated continuously in roll. I made three changes to help it fly better. First, I built a new, lighter wing. Next, I replaced the drag flaps with wingtip-aileron feathers, and third, I installed Kimbrough rotary-drive couplers to control all moving surfaces. In its current configuration, the model oscillates lightly in turbulence, much as a real bird does, but it's easily controlled and will stabilize nicely in still air.

The model is based on photos of vultures flying in thermals. It is approximately full size (66-inch span) but is roughly half the weight of a real turkey vulture. The wing construction incorporates a full-depth spar and a cambered-wing airfoil with reflex. The fuselage (body) is built with balsa formers, sheeting and balsa blocks for the head and minor fairing pieces. I cover my bird models with MonoKote film and paint the heads to match. This results in a model that is a true floater but does not penetrate the wind as well as a model with less camber. The model handles ballast well, and this can be used to somewhat improve penetration. Real soaring birds reduce their wingspan and area and increase their wing sweep when flying straight between thermals (more options for experimentation?).

Here, the Turkey Vulture climbs high on a bungee launch! After the model reaches maximum altitude, the launch line and the drop-away fin fall free of the model as it soars away.

Detailed instructions for building the Turkey Vulture model accompany the full-size plan. You can also view the detailed article and some related aerodynamic illustrations via the "Click Trip" Web address at the end of this article. Please let me know, through *Model Airplane News,* of your experiences with bird-like flight. ±

click trip
MODELAIRPLANENEWS.COM

For more information and to see the model fly, click on the article and videos link.

The latest in giant scale

If you live in the Northeast, one sure-fire sign that the winter building season is drawing to an end is the annual WRAM show in White Plains, NY. Every year, thousands of modelers trek to this modeling mecca to show off their latest projects and for a preview of things to come from the RC model industry. Hosted by the Westchester Radio Aero Modelers club, the 2002 show (the 34th) was definitely worth the trip.

This Krill Velox Revolution took up about half the display space in the RC Showcase booth. The 47-percent-scale unlimited aerobat has all-composite construction.

REALLY BIG STUFF

At this year's show, it was obvious that very big aerobatic models are in vogue. Several companies showed almost-ready-to-fly unlimited aerobatic planes in the 150cc engine-displacement range. Being able to see these Tournament-of-Champion-size aircraft up close is a great way to observe the latest trends. Typically, these giants have three servos per aileron, four servos for elevator and at least two servos for rudder control. For the ultimate in system redundancy, many pilots split their onboard RC systems in two by using a left- and a right-side receiver, battery pack and switch harness to control the servos on either side of the aircraft. Considering how much you can invest in one of these beauties, I'd say that installing a redundant radio system is a very good idea.

RC SHOWCASE REVOLUTION

I spoke with Mike Dooley of RC Showcase about the company's awesome-looking, all-composite, almost-ready-to-fly Velox Revolution. Manufactured by Krill, the 47-per-cent-scale model has a 135-inch wingspan, weighs about 50 pounds and is intended for the ZDZ 210 twin-cylinder gasoline engine. The finish on this molded-Kevlar and carbon-fiber beauty is flawless. The model basically comes as you see it in the picture and is ready for engine and radio installation. The most difficult part about this project would probably be finding a 47-percent-scale pilot figure to put under that beautifully molded canopy.

Left: *the ZDZ 210B2 is an impressive twin-cylinder gasoline engine with electronic ignition.*

This impressive Extra 330LX was in the J'Tec RadioCraft booth. The all-wood ARF is designed for a 150cc gas engine.

J'TEC RADIOCRAFT EXTRA 330LX

Next to our booth was an impressive Extra 330EX ARF. A scaled-up version of the popular J'Tec RadioCraft 35-percent aerobat, this ARF has a 123-inch span and 2,745 square inches of wing area. Weighing 38 pounds, the Extra has a respectable wing loading of 32 ounces per square foot. Designed around a 150cc-size engine, the 40-percent-scale 330LX comes with an engine-mounting box completely built, and right engine thrust is already incorporated into the structure. Pilot holes have also been drilled in the firewall for either the Desert Aircraft DAI50 or the 3W 150 engine. Made from laser-cut balsa and plywood parts, it has fully sheeted foam-core wing panels and horizontal stabilizer panels.

ZIROLI'S VENGEANCE

Always ready to show something new at the WRAM show, Nick Ziroli Sr. displayed his latest warbird project high above the Nick Ziroli Plans booth. Sporting an unpainted epoxy resin and fiber-glass cloth finish, Nick's Vultee A-31 Vengeance is a replica of an early American-built dive-bomber used in the South Pacific during WW II. Designed around a Zenoah G-62, the '/6-scale A-31 has a 96-inch span. The model uses Robart no. 150 90-degree

RC Showcase showed some new canister mufflers for its ZDZ engines. These mufflers are mounted internally in the airplane and are very efficient and quiet.

Bubba Splvey showed off his new Laser 200 in the Lanier **RC** *booth. Part of the Lanier 21st Century ARF line, the 1/3-scale Laser has a 96-inch span.*

rotating retractable landing gear (P-40 style) and has wing flaps. Nick's plan as well as a fiberglass engine cowl and a molded greenhouse canopy will be available soon. The model uses traditional balsa and plywood construction, with formers assembled over a flat stick-built alignment crutch. If you want something just a little bit different for the flying field, Nick's Vengeance should do the trick.

LANIER LASER 200

The new IMAA- and IMAC-legal 1/3-*sca\e* Laser 200 ARF from Lanier RC has a 96-inch wingspan and 1,596 square inches of wing area. Its fuselage is 79 inches long, and the model is intended for 3.2 to 4.2 2-stroke and 2.4 to 3.0 4-stroke engines. With an estimated flying weight of from 17 to 22 pounds, the new Laser should be a performer and have excellent landing characteristics. Part of Lanier's 21st Century ARF line, the kit comes with nearly everything you need except radio equipment and an engine. High-quality hardware is included. The model has removable wings that are strengthened with an aluminum spar. A factory-painted fiberglass engine cowl and wheel pants match the covering precisely. If you're looking for a new aerobatic giant, Lanier's new Laser 200 is a classic design that delivers.

KANGKE LASER 2000

Super Kraft planes are manufactured by Kangke Industrial and use traditional balsa and plywood construction. The new 87-inch Laser 2000 is completely jig-built at the factory with plug-in wing panels and is covered with Oracover film. Intended for experienced fliers, the Laser has 1,275 square inches of wing area and should weigh between 16 and 18 pounds. Ideally suited for 40 to 50cc gasoline engines, the kit comes with painted fiberglass

Here are the parts from the new Kangke Laser 2000 kit. Built of light balsa and plywood, this aerobat is perfect for a Brison 3.2 gasoline engine. Watch for a review coming **soon.**

cowl, engine mount, landing gear, control horns, fuel tank, wheels and all necessary hardware and instructions.

S.I. MODELS WEEKS SOLUTION

S.I. Models provides a custom model airplane CAD service that offers model plan development, plotting/printing services and custom model aircraft graphics. The company also offers a plan for a beautiful 33-percent-scale Weeks Solution modeled after the full-size aircraft built by Kermitt Weeks. It weighs 19 l/4 pounds and is powered by a Zenoah G62. S.I. Models also offers an assembled cabane structure, landing

Nick Ziroli Sr. showed this ready-to-paint Vultee **4-31 Vengeance.** *The 1/6-scale dive bomber uses a Zenoah* **G-62** *for power.*

gear, canopy, a CD with construction photos, and a short kit with fuselage sides, wing ribs and other parts. The construction plans a are $40 each; the construction CD is $10; the complete hardware package is $115; and the wood short kit is $220. A 42-percent Solution is also available. For information, contact Tom Lowrie, RD 3, Box 153, Dalton, PA 18414; tomt^simodels.com, or call (570) 563-1445.

GLENN TORRANCE MODELS

I chatted with Glenn Torrance about his impressive WW I designs. Glenn exhibited two kits at the show: his Fokker Dr.l triplane and his latest Fokker D-VIII. Both are in 'A scale, and the kits are absolutely gorgeous. Many laser-cut parts are included, and Glenn offers two sets of plans with his kits—one full size and one reduced copy—to use as a reference while you build. National scale competitor Tom Kosewski was also in the booth with his scratch-built Fokker D-VII to show off Glenn's new '/i-scale printed lozenge fabric. Specializing in WW I aviation, Glenn has raised the bar for kit quality and completeness. Basically, his models are scaled-down versions of the real aircraft, and every detail is reproduced. Glenn uses laser-cutting in very creative ways—for thin leather sheets to provide a truly scale cockpit coaming. Even the holes in the plywood sheeting are laser-cut, so you can sew the leather padding into place! Quite impressive. Glenn's models are designed around the Laser 200 4-stroke engine, but other engines such as the Zenoah G-23 or Saito 180 can also be used.

The D-VIII has an 82.6-inch span and is 56.8 inches long. Its flying weight should be 16 to 18 pounds. The kit has more than 300 parts and a photo-illustrated 100-page construction manual.

Included are a two-piece aluminum engine cowl (with cable groove), laser-cut wood parts, stamped metal parts, precut plywood panels and plywood wing covering (35 pieces). Also included are dummy engine cylinders and Spandau machine guns (from Williams Bros.), lacing cord for stitching and cable bindings, seatbelt harness and fittings, laminated rudder and elevator outlines and functional landing gear—and many other parts too numerous to mention. Glenn also showed me a kit for his newest design, the unusual and seldom modeled Fokker D-VI. It is basically a biplane that uses the Fokker triplane fuselage, and this kit should be out in August. For the ultimate WW I airplane, Glenn Torrance Models is the place to look.

This impressive Weeks Solution biplane is available as a plan from S.I. Models. It comes in 33- and 42-percent versions, with many available accessories including hardware and a wood short kit.

Glenn Torrance Models raised the bar in kit quality and completeness with its Fokker D-VIII and Dr.I kits. A Fokker D-VI kit will be out soon.

There was so much more at the 2002 WRAM show, but I have only so much space in the column. Do yourself a favor and pencil in the last weekend in February 2003 on your calendar, and try to attend this Northeast modeling extravaganza. You'll be glad you did.

Engine advice

It's time again to answer your engine questions. We have a variety of situations this month, from an engine that isn't getting enough fuel to flying with antique powerplants to mixing your own fuel. Keep those letters coming; if you have a question you'd like to see answered here, please write to me c/o *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA, or email me at man@airage.com.

MIXING FUEL

Gerald Weiss of Menomonee Falls, WI, writes: "I am a 65-year-old model builder and flier. I have several old model engines from my childhood, including a K&B, GHQ, McCoy, Pacemaker .59 and O&R. The smallest engine is a .19, and all are in good running condition. 1 would like to use them, but where can I obtain—or how do I mix—new fuel for these engines? I can only get 5- or 10-percent-nitro fuel here. Should I add castor oil to these fuels?"

The author mixes his own fuel. The 5-gallon can on the left is methanol; the graduated cylinder holds 1,000ml; the plastic 5-gallon can (third from the left) contains nitromethane; the short gallon jug contains castor oil; the standard gallon container (far right) contains Klotz KL-200 synthetic oil. All fuel ingredients are available from Klotz. Many specialty fuel companies will custom mix fuel to your specifications; others already have the desired blend as part of their standard products.

Gerald, I wish that you had included the individual displacements for each of your engines. Some manufacturers such as McCoy used both lapped steel and ringed aluminum-alloy pistons with meehanite (fine-grain cast iron) cylinders. Others such as O&R produced only lapped-steel piston and cylinder units. Early K&Bs had lapped iron pistons and a steel cylinder. Both versions of the Pacemaker .59 were outfitted with a lapped-steel piston and meehanite cylinder. As for the GHQ (in my opinion, the worst American engine ever produced!), sell it to an engine collector; they have been paying up to about $125 for one of these lemons.

All of these early engines required extensive break-in with relatively high percentages of castor-oil-based fuel. Except for very early spark-ignition examples, K&B engines were all glow. McCoy started out with ignition but had mostly switched to the glow plug by the early '50s. The Pacemaker .59s were both spark ignition. The Ohlsson & Rice engines were originally spark ignition but finished their production run with glow plugs. If your Pacemaker, O&R and McCoy engines are still fitted with their ignition timer and breaker points, I suggest running them on spark ignition with gasoline/oil fuel. Here's a good mix: three parts (by volume) of regular-grade pump gasoline and one part SAE-70 oil.

Unfortunately, SAE-70 mineral oil is almost impossible to find today, but Klotz BeanOil castor oil (available at motorcycle shops) is a substitute that will not contaminate your engine's combustion chamber with carbon deposits. It's an excellent lubricant.

For glow O&R, K&B and McCoy engines, use 5- to 10-percent nitromethane, 25- to 30-percent Klotz BeanOil castor oil and 65- to 70-percent methanol. Several companies, including Wildcat Fuels, will mix this blend to your specifications. Don't attempt to use RC fuel in these old engines; 100-percent synthetic lube won't adequately protect lapped pistons and cylinders, and the percentage of lubricant is usually too low. If you know the oil content of the RC fuel, however, here's a useful formula for determining how much castor oil to add to bring it up to acceptable specifications:

$$\frac{(F - 1) \times A}{100 - F} = \text{oz. of castor oil to add}$$

Where:
F = final percentage of oil desired;
I = initial percentage of oil already in the fuel;
A = ounces of fuel you are treating.

Example: if you have a gallon (128 ounces) of 18-percent synthetic oil fuel, and you want to add castor oil to bring it up to 28 percent (not a bad idea with all that synthetic), find the following:

$$\frac{(10) \times 128}{100 - 28} = 17.8 \text{ oz.}$$

Therefore, add 17.8 ounces of Klotz BeanOil to the gallon of 18-percent synthetic-oil fuel. Of course, you will need another empty gallon jug to help mix all of this together, since the original container is now too small. Also, the actual percentage of nitromethane and methanol will decrease slightly but not enough to affect engine performance.

FUEL-STARVED POWERPLANT

Tom Schumacher sent this email. "I hope you can help me with a problem I'm having with my MDS 1.48. The engine is mounted inverted and powers a Hangar 9 1/4-scale Cub. I originally used the remote needle-valve setup with very poor results. It seemed that no matter how much the engine was turned to the rich side, I could never get it to 'four-cycle.' At first I thought that I might have an air leak somewhere in the fuel system, so I replaced the [fuel] lines and used wire-ties to cinch down every connection—no luck. I've now eliminated the remote needle valve all together.

Using the needle in the carb helped, but not much. Frustrated, I gave up; the Cub has been hanging in my garage ever since! After reading your article in the November 2001 issue of *Model Airplane News* concerning proper break-in, I purchased a test stand, hoping to figure out the problem with the 1.48, but I didn't. Before I ran the engine on the test stand, it had about 20 ounces of fuel through it. I was finally able to get the engine running at a rich four-cycle, but it took seven (!) turns to the rich side on the needle valve. This seems excessive. I've tried the old trick of using a small piece of fuel line around the needle valve to eliminate air leaks, but that didn't work either. When I go from seven to six turns out, the engine runs at peak rpm; there is no adjustability. I've considered replacing the carb but have no idea what to replace it with."

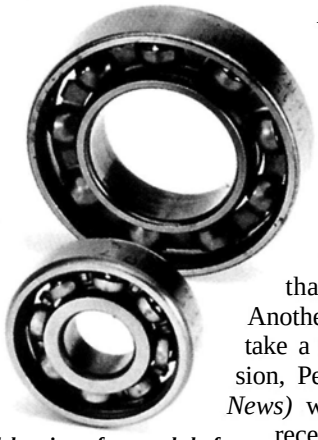
Tom, it's a shame that you've had all this trouble with the MDS 1.48 2-stroke engine; it seems like a good match for the Cub. The first thing that comes to mind is, what size fuel line are you using? You didn't say in your letter. Is it the large variety or the medium? If the latter, I suggest that you change to the larger size. Fuel-flow rates can exceed 2 ounces per minute at a rich "four-cycling" mode of operation with this engine, and that's a lot of flow for medium-size fuel line.

Another possible cause of the problem is a restriction within the carburetor itself. A piece of flashing or a chip from manufacturing processes could be lodged somewhere within the metering jet tube. Remove the carb from the engine and carefully disassemble it, looking closely at the jet and idle-needle assembly/interface. With the primary needle valve removed, blow air or force fuel through the spraybar with a fuel bulb/syringe to see whether it behaves as if it's restricted. Try running a piece of small diameter music wire, or a pipe cleaner, through the spraybar.

Last, make certain that the carb is tightly sealed to the neck of the crankcase; even a small air leak can lean a fuel mixture in a hurry.

NEW BEARINGS FOR A MOKI

D. Gibbs emails: "I have a three-year-old Moki 1.8. It starts very easily, runs very reliably and has plenty of power. In mid-flight the other day, however, the engine stopped. The front [ball] bearing had failed, and a small piece of steel from the failed bearing had lodged at the very front of the crankcase housing, between it and the crankshaft. This caused only very minor damage to the housing, just behind the front bearing, and didn't damage the crankshaft at all. Using 600-grit wet/dry abrasive paper and some mild detergent mixed with water for lubrication, I was able to completely clean up the inside of the housing. The large, rear ball bearing seems fine, but I figured that while I had the crankcase housing unbolted from the crankcase, I would change out both bearings. I had previously acquired replacement bearings from a local supplier, but unlike the unsealed originals, these are sealed. The new bearings are good-quality units from SKF. Would it be all right to replace the old bearings with the sealed units? Does it make a difference?"



Ball bearings for crankshaft support—front and rear.

Mr. Gibbs, the seals on your replacement bearings won't hurt a thing, so install them as is; the grease will simply wash out during engine operation. If you don't like the slight frictional drag that the seals produce, simply remove them. Pry them from their seats with a tiny slot-type screwdriver (such as those used by jewelers), or use a hobby knife with a no. 11 blade. Don't touch (and possibly damage) the balls in the process (unlikely, since you'll be careful!). You can then wash out the grease with a solvent; I like to use lacquer thinner because it doesn't attract rust-producing water from the air (caused by hygroscopic action, as occurs with alcohol). Allow the bearings to dry naturally. Don't use compressed air to hasten drying; dirt in the airstream could contaminate the bearing assembly. Lubricate them with Marvel Mystery Oil and install them in your Moki.

OLDER FOX ENGINES

Mr. B. Jackson of Burlington, Ontario, Canada, writes: "I purchased four old Fox engines, including an early .78 with an exhaust baffle coupled to the carburetor. Two Fox .36s and a Fox .29 completed my find; all engines are new in the box! When I told my fellow club members that I was going to use one of the .36s in a Balsa USA Stick 40, they told me that Fox .29s and .36s were hard to start, the carburetors were difficult to adjust, and they really vibrate—especially in a lightly constructed model such as the Stick 40. They also informed me that the Fox .29 and .36 require a minimum of 15-percent nitromethane in the fuel. Can you tell me how much of this information is fact and how much is fiction?"

Mr. Jackson, it sounds as though your Fox .29 and .36s are equipped with cast-iron pistons and steel cylinders. This combination required several hours of patient break-in before the iron and steel were "bedded-in" and heat-cycle stress relief was achieved. The break-in fuel was very important to the "iron Fox"; it required a minimum of 25-percent castor oil (preferably 28 percent, with a low nitromethane percentage—about 5 percent). Although the Fox instructions were clearly written, many modelers ignored them and tried to fly the engine right out of the box; this never worked and gave rise to the problems described by your club members. In my opinion, this was not the fault of the manufacturer or the engine. Properly broken in, Fox engines are great runners.

In reference to Fox carburetors, I'd like to note that Duke Fox produced more carburetor designs than any other manufacturer during the '60s and '70s. Another prolific producer of carb designs, SuperTigre, had to take a back seat to Fox in this arena. On at least one occasion, Peter Chinn (past engine columnist for *Model Airplane News)* was diligently trying to explain the workings of a recently released Fox carburetor while Duke Fox was promoting a newer version in an ad in the same issue!

With proper break-in and fuel (5- to 10-percent nitro is plenty), Fox R/C .29s and .36s are easy to start, smooth running and very throttleable—if the owner follows Duke's detailed instructions. As an added benefit, a properly maintained "iron Fox" will run and last forever.

Klotz Special Formula Products Inc., *7424 Freedom Way, Fort Wayne, IN 46817; (800) 242-0489; fax (219) 490-0490; www.klotzlube.com.*

NAME THAT PLANE

Can you identify this aircraft?

SEND YOUR ANSWER to *Model Airplane News*, Name that Plane Contest (state issue in which plane appeared), 100 East Ridge, Ridgefield, CT 06877-4606 USA.

Congratulations to Eric Fotheringham of Upton, MA, for correctly identifying April's mystery plane as the Avro Lincoln, the last piston-engine bomber to serve the Royal Air Force (RAF)- Virtually a scaled-up version of its predecessor—the famous Lancaster bomber—the Lincoln was powered by four Rolls-Royce Merlin 85 engines with annular radiators. Armed with twin .50-caliber Browning machine guns in the nose turret, two 20mm Hispano Mk4 or Mk5 cannon in the dorsal turret, twin .50-caliber machine guns in the rear turret and up to 14,000 pounds of bombs, the Lincoln was originally intended for use in the Pacific theater, but it arrived on the scene too late for operational service. First issued to the RAF in September 1945, the Lincoln became its standard postwar heavy bomber, and 20 squadrons were eventually equipped with the plane. The 120-foot-wingspan bomber was produced in several different versions, and in addition to 168 aircraft built by Avro, Lincolns were also produced by Armstrong-Vickers and Armstrong Whitworth and in Canada and Australia. One Lincoln was even converted for the bulk uplift of fuel and made 45 civil runs during the Berlin Airlift.

The winner will be chosen, four weeks following publication, from correct answers received (delivered by U.S. mail) and will be awarded a free, one-year subscription to *Model Airplane News.* If already a subscriber, the winner will be given a free, one-year subscription extension.

MODEL AIRPLANE NEWS

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EVENTS

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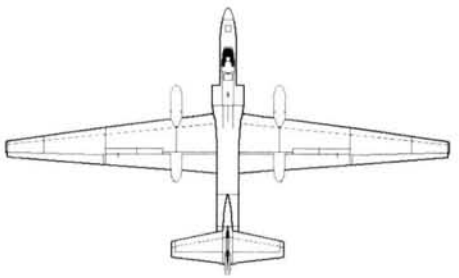

AT MODEL AIRPLANE NEWS, we not only tell you what's new, but we also try it out first so we can bring you mini-reviews of the stuff we like best. We're constantly being sent the latest support equipment manufacturers have to offer. If we think a product is good—something special that will make your modeling experiences a little easier or just plain more fun—we'll let you know here. From retracts and hinges to glow starters and videotapes, look for it in "Product Watch."

JR
MatchBox
Servo matching and power distribution

Intended for modelers of giant-scale craft and others who want to use multiple servos on a single channel, the new JR MatchBox is an onboard electronic device that precisely matches servos used on a single channel. Digital servos give modelers a new level of control precision, but slight variables in control-linkage geometry still remain—especially when more than one servo is attached to a single control surface. Examples of this are giant-scale, TOC-style aerobatic airplanes that use three servos per aileron and two servos per elevator half. The slightest mismatch between these grouped servos can cause increased current drain as the servos fight each other. Now, however, there is an easy solution to this problem. The MatchBox allows modelers to match servos with precision and offers servo-setting flexibility. Weighing just over 0.33 ounce, the unit is about the same size as a small receiver and can be plugged into any channel that drives more than one servo. Up to four servos can then be plugged into it and, using the selector dial and buttons, the servos can be independently adjusted. The unit allows adjustments to neutral point (subtrim), endpoint and direction reversing.

A big plus is that the MatchBox also lets you power the servos with a separate auxiliary battery pack! This is highly recommended if you are driving three or four high-current servos. You do have to use a switch harness for the second battery pack to switch off the power to the unit. A power shunt is also included and is plugged into the battery port if an auxiliary battery pack is not used.

The MatchBox can also be used in a Y-harness configuration where the servos on a single channel are used for various applications. An example is split elevator halves, with a servo used to move each half. Each servo's endpoint can be adjusted and, if needed, one of the servos can be reversed to give the proper elevator input. Typically, this kind of setup flexibility is only offered with a programmable computer radio.

The MatchBox is very easy to use. The selector dial has 10 positions (0 through 9). Positions 1 through 8 correspond to the numbered servo plug-in slots on the opposite end of the unit. To select a servo and adjust it, you simply turn the selector to the corresponding position number and then push either the Increase (+) or Decrease (-) buttons to make the desired adjustment.

• Position 0 is the default position to which the unit should be turned for normal operation. Any adjustments that are made are stored in memory when the dial is returned to 0. This must be done before the airborne system has been shut off. If power is turned off before the dial is set at 0, the settings will be lost.

• Selecting any dial positions from 1 to 4 allows the modeler to make servo neutral point and endpoint adjustments to the servos using a combination of transmitter stick positions and the Increase or Decrease buttons. With the control stick in the neutral position, you can adjust the neutral point of the selected servo, and with the stick in the extreme left or right position, the endpoints can be adjusted.

• Selecting positions 5 to 8 allows servo-reversing. As before, these adjustments are made using the transmitter stick position (neutral) and the buttons.

You can reset the MatchBox to the factory default settings by turning the selector to position 9 and then simultaneously pressing the Increase and Decrease buttons.

The MatchBox comes with detailed instructions, a short wire lead to connect to the receiver and a battery power shunt. If you would like to add a greater degree of servo adjustment to your next model, for $69.99, the JR MatchBox is a handy little device to have around. I've used it, and I like it! I think you'll like using it, too. —Gerry *Vanish*

JR; distributed by Horizon Hobby Inc., 4105 Fieldstone Rd., Champaign, IL 61822; (800) 338-4639; www.horizonhobby.com.

SANDMAN ABRASIVE PRODUCTS

Foam-backed sanding pads

Flexible finishing tools

Whether you are applying an iron-on film or a painted finish, to achieve a great-looking model, you need to have a smooth surface under it. To get that perfect surface, you have to do a lot of sanding, and Sandman Abrasive Products' foam-backed sanding pads are the right tools for the job. These abrasive-coated pads come in various shapes, can be used wet or dry and come in grits from 80 to 600.

They can be used to sand balsa, fiberglass and plastic surfaces, and finer grits can be special ordered. The pads fit comfortably in your hand, and they conform easily to contours such as wing leading edges, fuselage turtle decks and wing fillets. They are also great for sanding fiberglassed wing surfaces and for smoothing primer to obtain a very smooth paint surface. The differently shaped pads, such as the radius block or the slanted block, are ideal for sanding hard-to-reach edges and surfaces. I like the fact that the pads are washable and can be used for many years. I found the finer 2,000 and 4,000 grits ideal for removing scratches from clear plastic canopies. The Sandman foam pads are great companions to the traditional hardwood-sanding block on your workbench. *—Rick Bell*

Sandman Abrasive Products, 12676 Pierce St., Unit 6, Pacoima, CA 91331; (818) 834-8851; (888) 954-1800; fax (818) 834-8850; www.sandmanabrasives.com.

GREAT PLANES

Power Plane

Save time and elbow grease

Removing material from leading edges, nose blocks and wingtips can be a time-consuming job. First, you have to carefully cut away chunks of material and then use a razor plane to smooth the part so you can sand it to its final shape. Don't get me wrong; I love my building time in the shop, but like anyone else, I like to save time, too. The new Great Planes' Power Plane is a handy workbench tool and a great timesaver.

The Power Plane removes material from flat surfaces as easily as an electric-powered rotary cutter, but you can also set the depth of the cut accurately (as finely as 0.030 inch at a time). It has a spiral rotary-cutting blade.

I had excellent results the very first time I used it. The tool is plugged into any 110V AC outlet for power, and it is light and easy to hold. It feels a lot like holding a curved sanding block, but it removes a considerable amount of material with each pass. Its two power buttons allow you to operate it with either hand. Since you have to depress **both** buttons, **the** unit can't be turned on accidentally by tipping it over on its side, nor can it be left on by mistake.

The cutting blade is easy to remove and can be replaced when it gets dull. I have used the Power Plane on balsa and lite-ply sheeting, and it works very well. The instructions recommend that you not use the tool on hardwoods such as oak, maple and birch.

If you're looking to save a little time and want the newest gadget for the workshop, the $29.99 Great Planes Power Plane is just the ticket. *—Gerry Yarrish*

Great Planes Model Mfg. Co., PO. Box 9021, Champaign, IL 61826-9021; (800) 637-7660; www.greatplanes.com.

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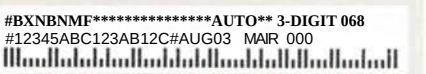

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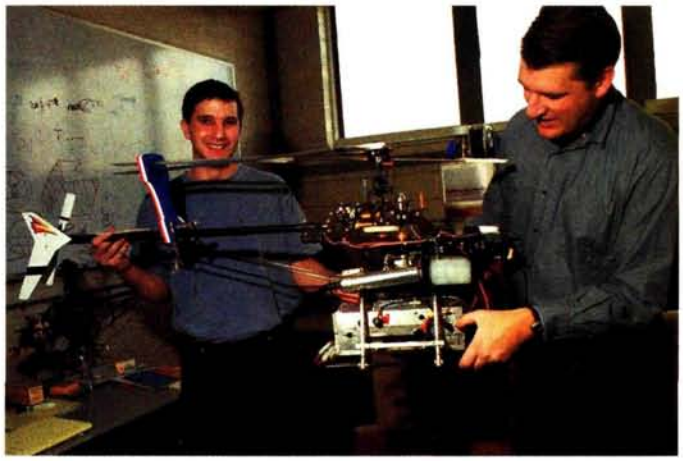
BY WILLIAM SIURU

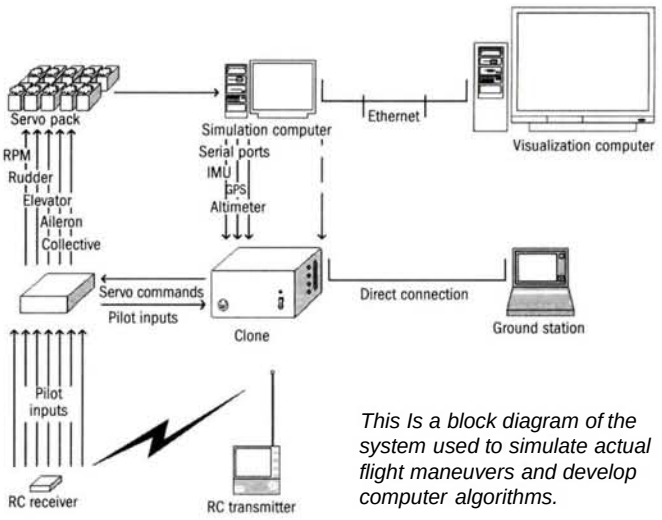
The next-generation UAV

The Predator and Global Hawk unmanned aerial vehicles (UAVs) are playing key roles in the war on terrorism. Predators equipped with Hellfire missiles can seek out and destroy enemy targets. Other Predators fly reconnaissance missions over Iraq. UAVs are great for high-risk missions because they don't endanger human pilots, but they fly slow and, thus, are vulnerable to hostile antiaircraft fire. They also must be flown by highly skilled pilots on the ground. Last, they are expensive; Predators cost about $2 million each.



*Graduate student Loannls Martlnos and Professor Eric Feron of the Department of Aeronautics and Astronautics at **MIT** hold the robotic helicopter they helped develop.*

Here, Me *X-Cell 60 RC hell-copter Is In flight with the techno-logically advanced control system on board.*



This Is a block diagram of the system used to simulate actual flight maneuvers and develop computer algorithms.

With Navy funding, researchers at the Massachusetts Institute of Technology (MIT) are developing the technology to produce more maneuverable, more intelligent and less expensive UAVs. Researchers equipped an X-Cell 60 RC helicopter with a 7-pound instrumentation box containing inertial sensors, a global positioning (GPS) receiver, an altimeter and a computer. Flown manually by a trained UAV pilot, the robot helicopter performed a 360-degree aileron roll at high speed. The maneuver was recorded, and the information was used to create a computer simulation from which the researchers developed the autonomous control software for the helicopter's onboard computer. The maneuver was then repeated robotically to achieve the first-ever autonomous acrobatic maneuver with a helicopter. Researchers are currently working on a split-S—a basic combat maneuver used by pilots to reverse direction quickly.

The control system works by memorizing the maneuvers performed by an experienced human pilot and breaking down the complex pilot inputs into basic mathematical algorithms. In "building-block" fashion, the computer can then create new, complex maneuvers just by recombining the various sets of algorithms. This development makes it possible to program and fly aggressive maneuvers that may have been previously unheard of, giving UAVs a decided advantage in a hostile environment. On a typical mission, a human pilot on the ground would manually control the UAV through basic maneuvers such as takeoff and landing, though autonomous takeoff and landing have already been demonstrated. With a flip of a switch on the control box, the helicopter would then fly autonomously.

This new technology presents many possibilities. Small, agile, robotic helicopters could perform military reconnaissance or carry weapons. They would be particularly attractive for use in mountainous, urban and other challenging areas that are currently too dangerous for larger, manned aircraft. They could fly at low altitude and in tight spaces to locate terrorists in caves and record live images that could be transmitted to the ground or to manned aircraft in flight. Civilian versions could survey disaster sites that are too dangerous for manned operations. According to the researchers, the technology could, in the future, yield a 6-inch version able to fly robotically through an air-conditioning duct, land inside a room and covertly listen in on a conversation.

The robot helicopter is equipped with vibration-isolation gear to protect the electronic equipment; this gear could also keep a camera still, which would give filmmakers a more economical way to shoot blur-free aerial footage.

The researchers estimate that a military robotic helicopter with a range of at least several hundred miles would cost around $500,000. A non-militarized version for filming aerial imagery would cost significantly less. Though the military is currently testing unmanned helicopter drones, these would probably not be in service until after 2006. +